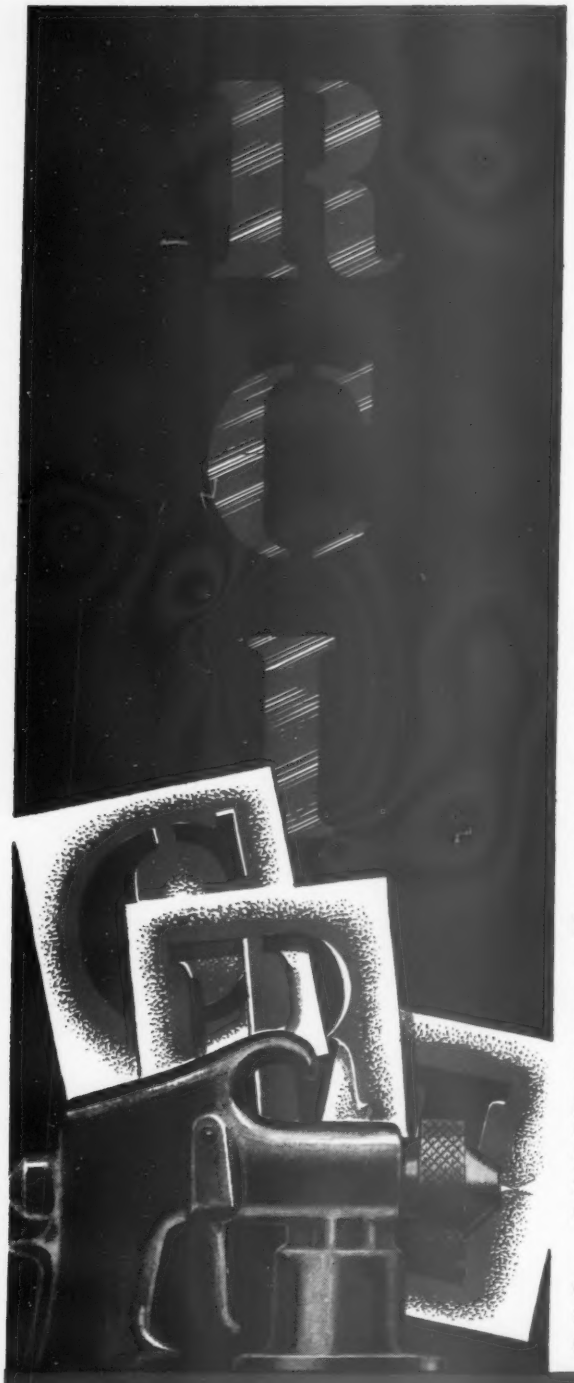
PAINT and VARNISH

THE TECHNICAL MAGAZINE FOR MANUFACTURERS OF PAINT, VARNISH, LACQUER AND OTHER SYNTHETIC FINISHES



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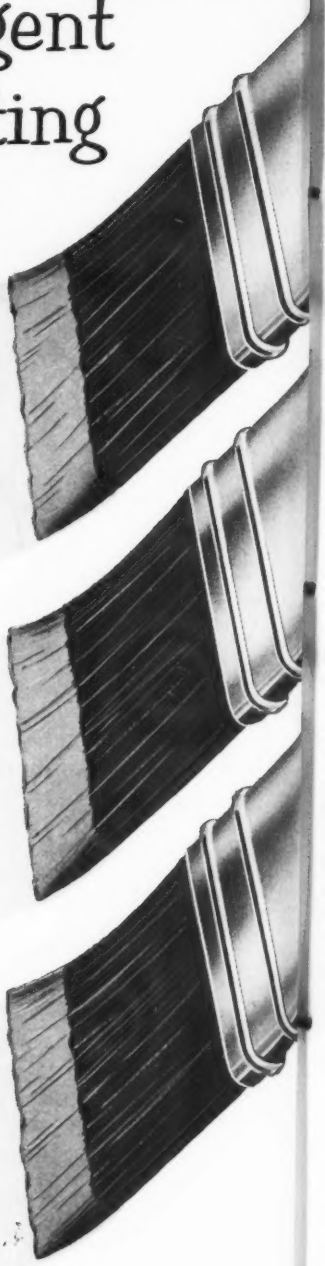

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PAINT and VARNISH Production

(REG. U.S. PATENT OFFICE)

Formerly PAINT and VARNISH PRODUCTION MANAGER
(Established in 1910 as The Paint and Varnish Record)

VOL. 47 FEBRUARY, 1957 NO. 2

NEXT ISSUE

Commencing with the March issue, we are pleased to present an informative series of articles on pigment colors for paint. This series of articles is designed to thoroughly familiarize the paint formulator with the chemical and physical characteristics of colored synthetic pigments. The pigments which are to be discussed in this series fall into four major color groups: blues and violets, yellows and oranges, reds and maroons, and greens.

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ANTHONY ERRICO, *Editor*

A. L. BENDER
Production Manager

HOWARD KENT
Editorial Ass't.

MARY WILLIAMSON
Circulation Manager

PHILIP J. SEAVEY
Advertising Manager
ALAN P. DANFORTH
855 Ave. of Americas
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700 S. Washington Sq.
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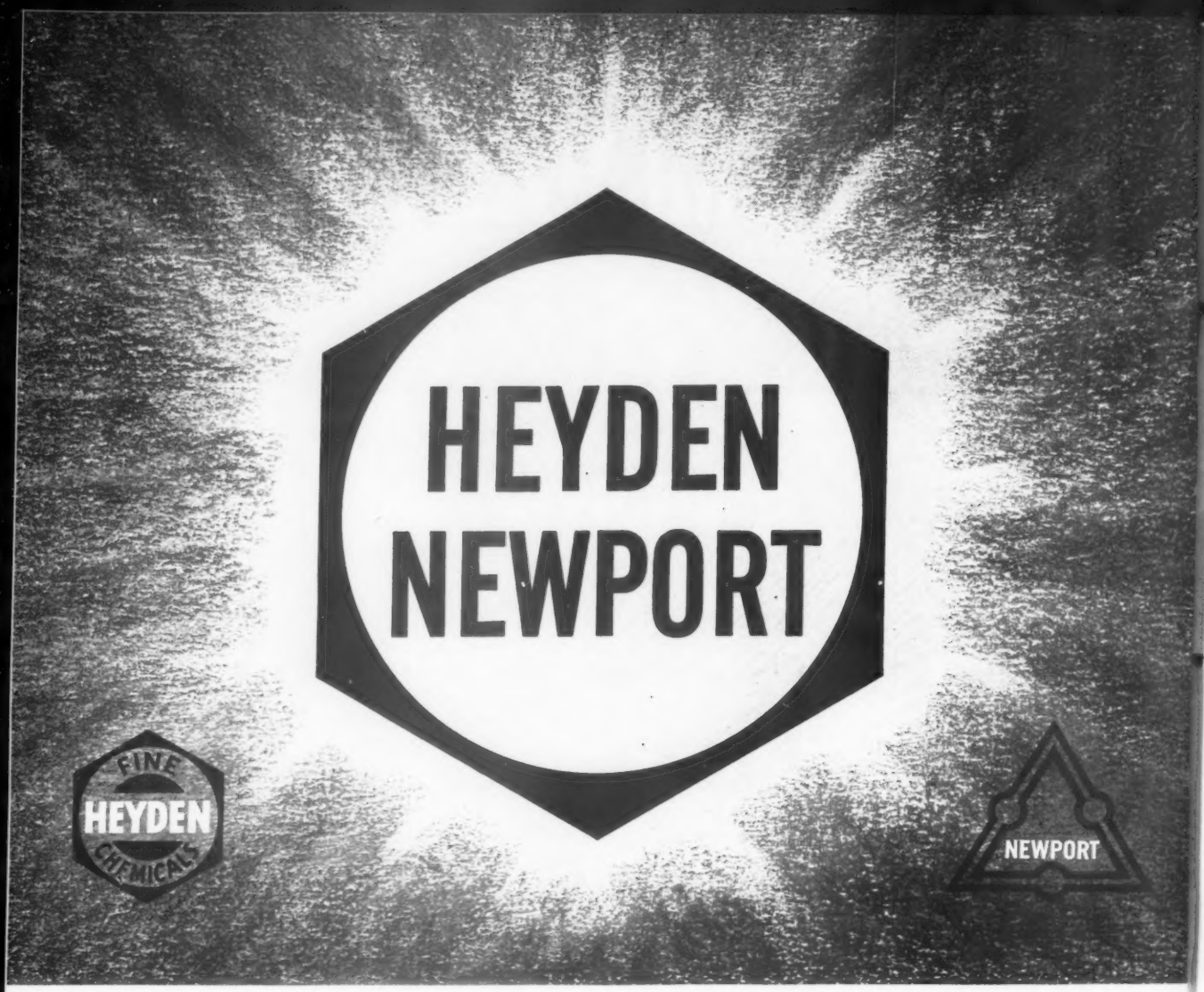

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New Slant on Oil Chemistry

IN recognition of recent research contributing to new knowledge and use of glycerine, Dr. Herbert J. Dutton, a research chemist with the Department of Agriculture, recently won first award in the 1956 Glycerine Research Awards sponsored by the Glycerine Producers' Association.

Dr. Dutton's accomplishment was the application of an extraction technique to investigate complex natural glycerides such as linseed oil. His work is considered as a major break-through in developing new and significant data on fats and oils, which are mixed esters of fatty acids and glycerine.

Employing a multi-stage liquid-liquid extraction method to linseed oil, Dr. Dutton was able to accurately separate trilinolenin, linoleo-dilinolenin, oleo-dilinolenin and other triglycerides. This achievement was especially significant since it was the first time that trilinolenin and lineo-dilinolenin had been isolated from a natural oil. Because the two triglycerides are so similar in chemical structure quantitative separation of the two is considered quite a laboratory feat. Trilinolenin, which has a molecular weight of 870, differs from linoleo-dilinolenin (molecular weight of 872) only in that it has one more double bond.

These analytical determinations on the collected fractions showed the amounts of trilinolenin and lineo-dilinolenin and other triglycerides present in linseed oil. Comparing these experimental values with the amounts of different triglycerides calculated to be present in linseed oil according to theories of "even" and "random" patterns of distribution, Dr. Dutton concluded that linseed oil triglycerides follow the "random" pattern. This is contrary to widely held views that vegetable oils are constructed according to the "even" pattern.

The fundamental data which has evolved from Dr. Dutton's studies on the structure of natural glycerides is said to shed light on the mechanism by which these glycerine derivatives are synthesized in nature; points to commercial potentialities for separating chemically pure triglycerides or "tailor-made" fractions from fats and oils; and enhance the utility of fats and oils as industrial chemical raw materials.

The results of Dr. Dutton's findings will undoubtedly be of interest to all coating technologists as fatty acids and their derivatives still hold an important place as basic materials for protective finishes.

Out of the Past

A few weeks ago, the *New York Times* carried an interesting item concerning the search for the remains of 256 Colonial soldiers under the former Red Devil Paint Company in Brooklyn, which company has since migrated to Westchester County.

According to the historical record, the site of this plant was part of the old Van Brunt Farm where on August 27, 1776 the Battle of Long Island raged. The Fifth Regiment of Maryland Volunteers, under a Col. Smallwood, attacked a larger British and Hessian force, preventing encirclement while George Washington withdrew his main force.

At least 256 Marylanders died and were buried by the British in fifteen long trenches, according to James A. Kelly, official historian for Brooklyn. The burial trenches were still visible in 1905 when they were paved over to make a coalyard.

Mr. Kelly hopes to make the site a national monument if the remains of these soldiers can be found.

It is no wonder that the Red Devil Paint Company moved to more pleasant surroundings. The moans and groans that must have rung throughout their Brooklyn plant simply scared the devil out of them as the enemies of the Red Coats insisted upon being heard!

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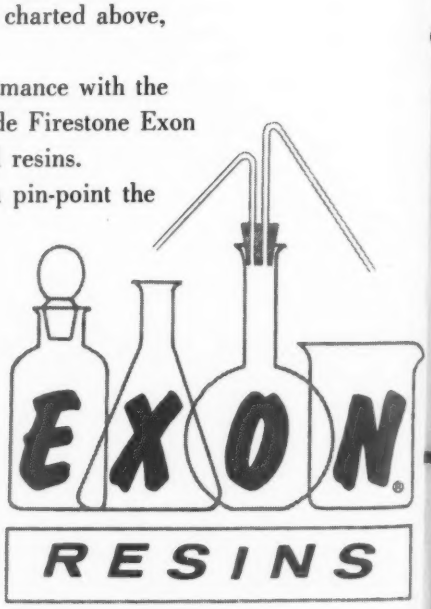
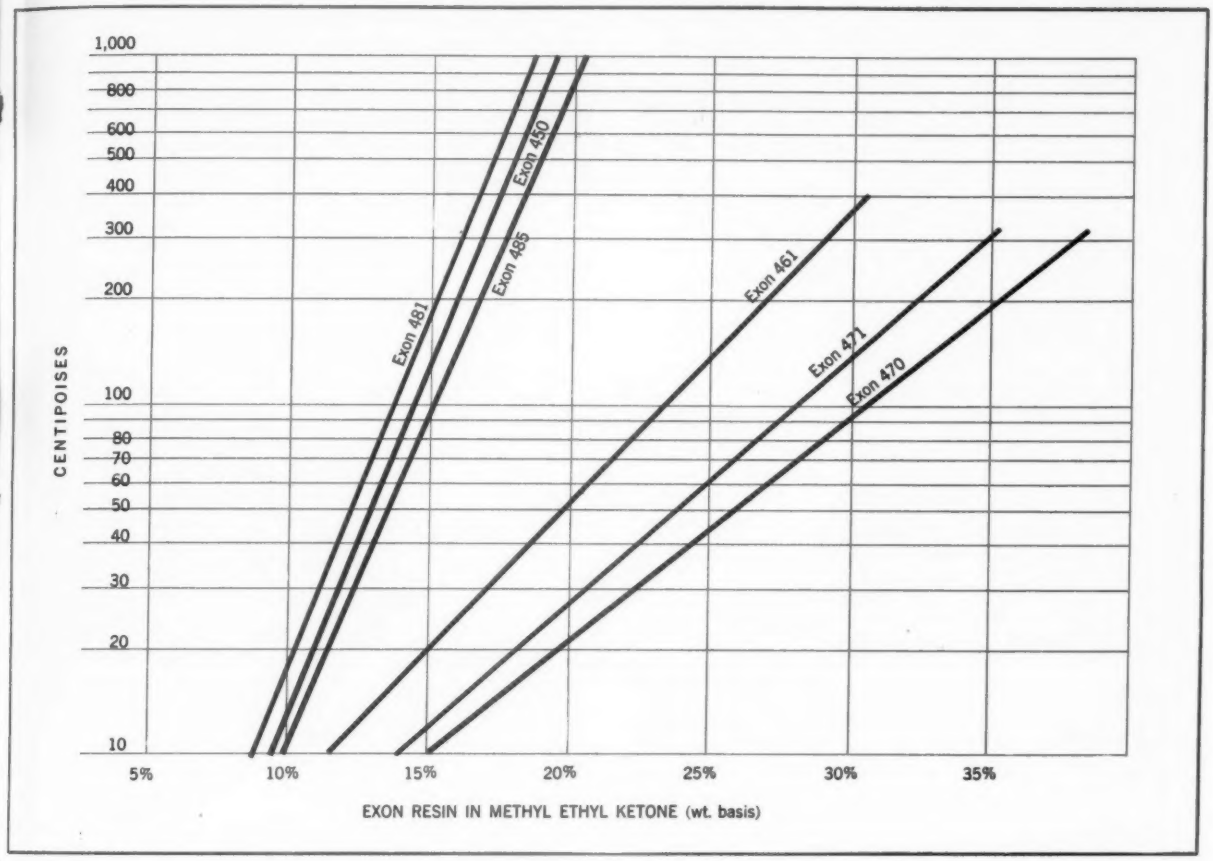


EXON CHARTS SOLUBILITIES to help you choose the resin with properties Pin-Pointed to your special needs!



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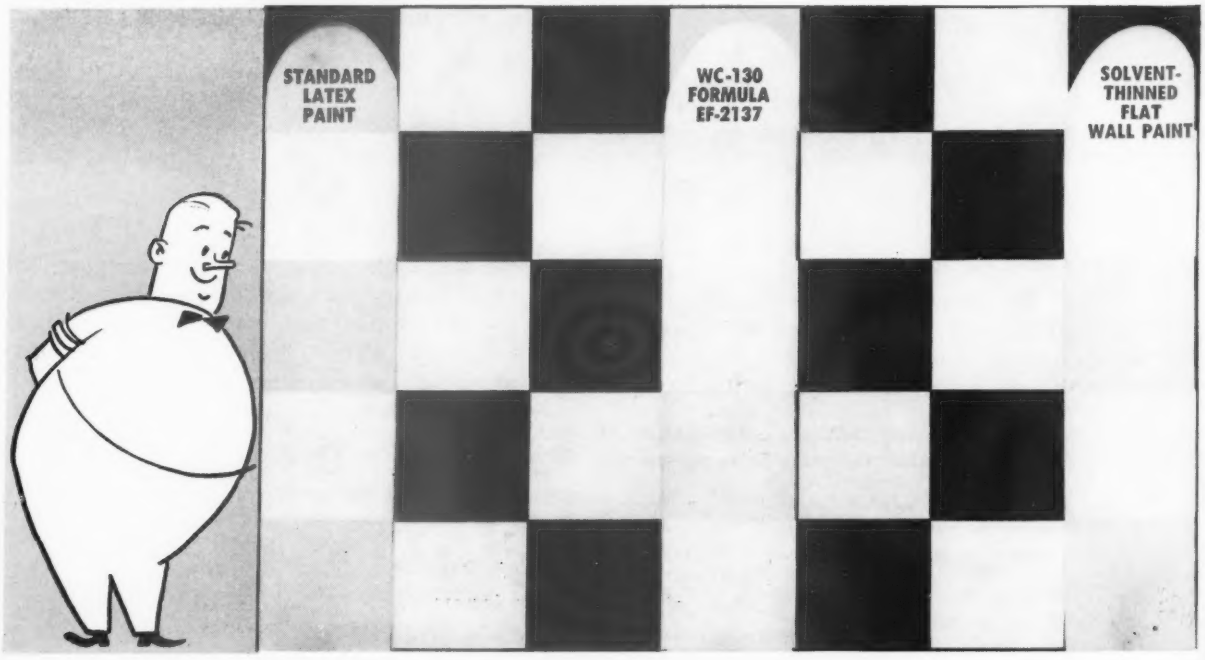
Note this checkerboard test: The center panel is covered with WC-130 based paint. Hiding power is at least equivalent to that of a high-quality flat used over the right portion, and obviously much superior to a conventional latex-based paint used over the left portion.



# of BAKELITE WC-130 Latex

A TYPICAL FORMULATION FOR HIGH-QUALITY, LOW-COST PAINTS BASED ON "BAKELITE" LATEX WC-130

FORMULA NO. EF-2139

White Interior Wall Paint 69.8% PVC

Formula:	Lb.	Gal.	Wt. %
BAKELITE vinyl acetate resin latex WC-130 (58.5% N. V.)	121.59	13.07	10.37
Titanium dioxide pigment[1]	148.32	4.24	12.66
"Lorite" filler	341.65	16.15	29.15
Water	390.59	46.90	33.33
Ethylene glycol	13.82	1.49	1.18
"Tamol" 731 dispersant (25% solution)	19.90	2.16	1.70
Ammonium polyacrylate (15% N. V. solution)[2]	12.86	1.46	1.10
CARBITOL solvent	17.73	2.07	1.51
Butyl CARBITOL acetate solvent	17.73	2.17	1.51
Dibutyl phthalate plasticizer	7.11	0.81	0.61
CELLOSIZE hydroxyethyl cellulose thickener WP-300 (7.5% N. V. solution)	71.86	8.43	6.13
Rust Inhibitor[3]	2.92	0.34	0.25
Pine Oil	1.17	0.15	0.10
Wetting Agent (25% solution)[4]	4.66	0.56	0.40
Theoretical Yield	**1171.91**	**100.00**	**100.00**

1 Rutile, semi-chalking grade, TT-T-425 Type II.
2 For example, "Good-Rite" K-707.
3 For example, "Nox-Rust" #702.
4 For example, 25% aqueous dispersion "Aerosol" OT.

MANUFACTURING PROCEDURE:

Preparation of Pigment Paste: Charge 68% of the water to a pebble mill. Add the 25% "Tamol" 731 Solution and pine oil, mix well. Add the pigments and grind for 24 hours.

Preparation of the Paint: Add the various components to a paint mixer in the following order: Agitation should be continuous during each addition and each component should be dispersed before the next is added. Pigment paste, ammonium polyacrylate solution, ethylene glycol, WC-130 latex, dibutyl phthalate, CARBITOL solvent, Butyl CARBITOL acetate, rust inhibitor, wetting agent, balance of water, and CELLOSIZE WP-300 solution.

PROPERTIES: Viscosity—1220 cps. (Brookfield, 60 rpm, #4 spindle.) 70 Krebs units (150 gram weight).
Non-volatile—49.75%.
Pigment-volume ratio—69.8%.
Weight per gallon—11.7 lbs.
Freeze stability—Excellent—3 cycles, room temperature to —6° F.

This formula is for release only to coatings formulators. Based on Bakelite Company Laboratory results, it appears to offer merit in performance characteristics. However, because of the possible variations in the nature and quality of some of the ingredients used in this formula and in the condition under which they are produced, Bakelite Company is unable to guarantee like or optimum values for all coating properties and performance data.
Data and suggestions made in this publication are not to be construed as recommendations to use any product in violation of existing patents covering any material or its use.

Effect of Filming Aid Concentration on the Scrub Resistance of Interior Paints Based on BAKELITE Vinyl Acetate Resin Latex WC-130

Pigment-volume Concentration, %	30	37.8	40	45	50	60	70	70
Weight Ratio * Pigment/WC-130 Binder	1.42/1	1.81/1	1.94/1	2.36/1	2.68/1	3.8/1	5.6/1	5.6/1
Parts Filming Aid (Plast.—Solvents) per 100 parts tot. paint solids	7.9	6.8	6.5	5.7	5.15	6.5	4.7	7.3
Scrub Resistance**								
No. of Cycles	950	1400	2000	2000	400	2000	190	1700
% Rubbed Off	50	50	3	10	50	0	50	60

Stripping type failure—others failed by erosion

These test filming aid concn. vs. scrub resistance at constant pvc

*Binder calculated as WC-130 solids with 10% dibutyl phthalate added.
**Scrub resistance measured on coats brushed on primed Morest charts, using 5% "Ivory" soap solution.

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BUTYL STEARATE	Waterproofing agent; stripping compositions; in cable, leather and paper lacquers; aluminum paint.
DIBUTYL PHTHALATE	Standard plasticizer in nitrocellulose lacquers; used in adhesives, molded products, vinyl resin finishes.
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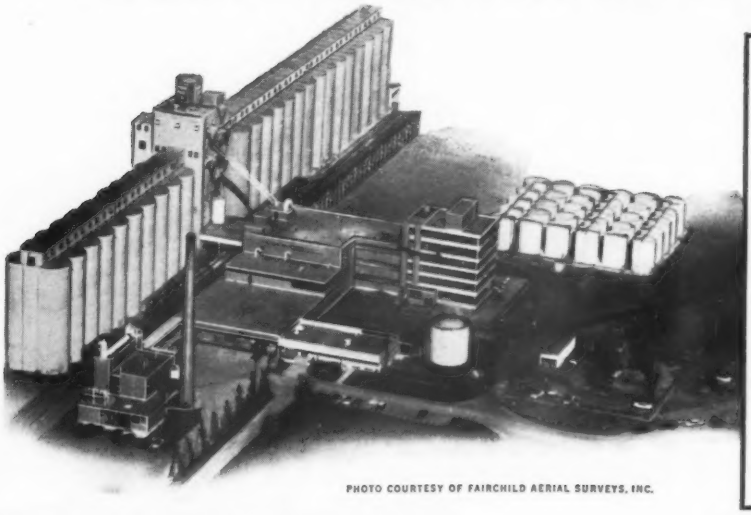

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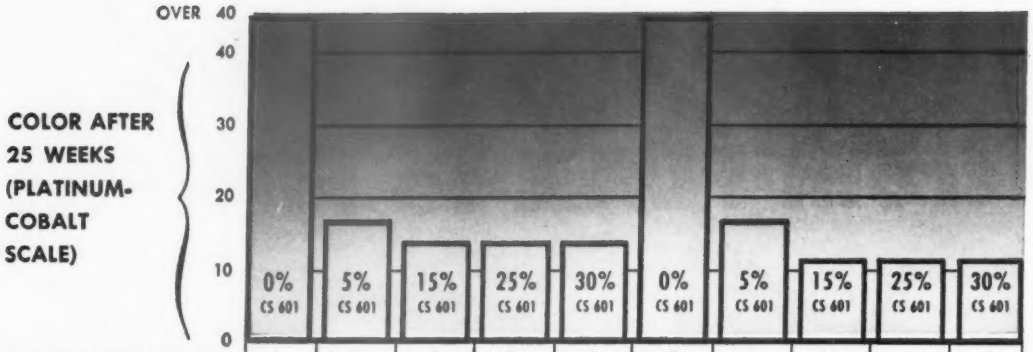

THINNER FORMULATIONS	A	B	C	D	E	F	G	H	I	J
Butyl Acetate	40	35	25	15	10	—	—	—	—	—
Methyl Isobutyl Ketone	—	—	—	—	—	40	35	25	15	10
CS 601	—	5	15	25	30	—	5	15	25	30
Isopropyl Alcohol	15	15	15	15	15	15	15	15	15	15
Toluol	25	25	25	25	25	25	25	25	25	25
Lactol Spirits	20	20	20	20	20	20	20	20	20	20

NOTE: The data above were developed by tumbling the nitrocellulose solution for a period of 25 weeks in jars containing steel balls.

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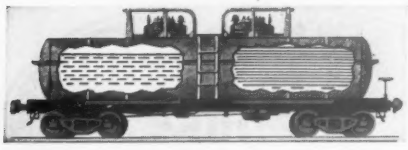

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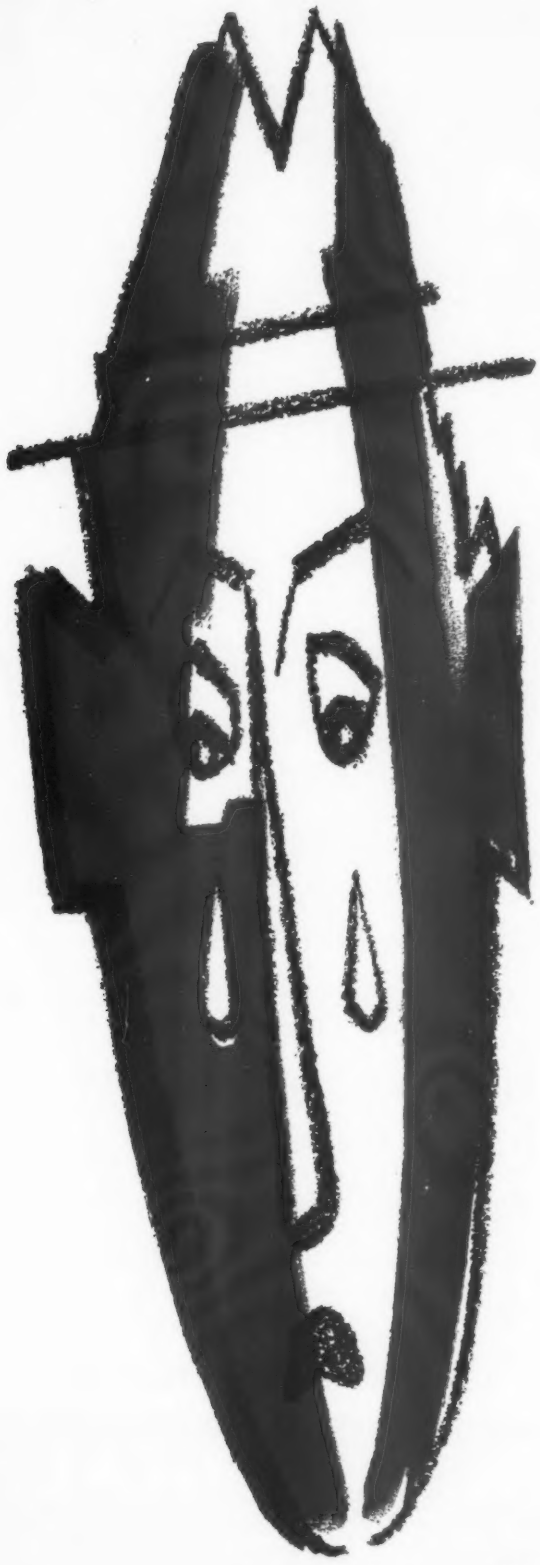

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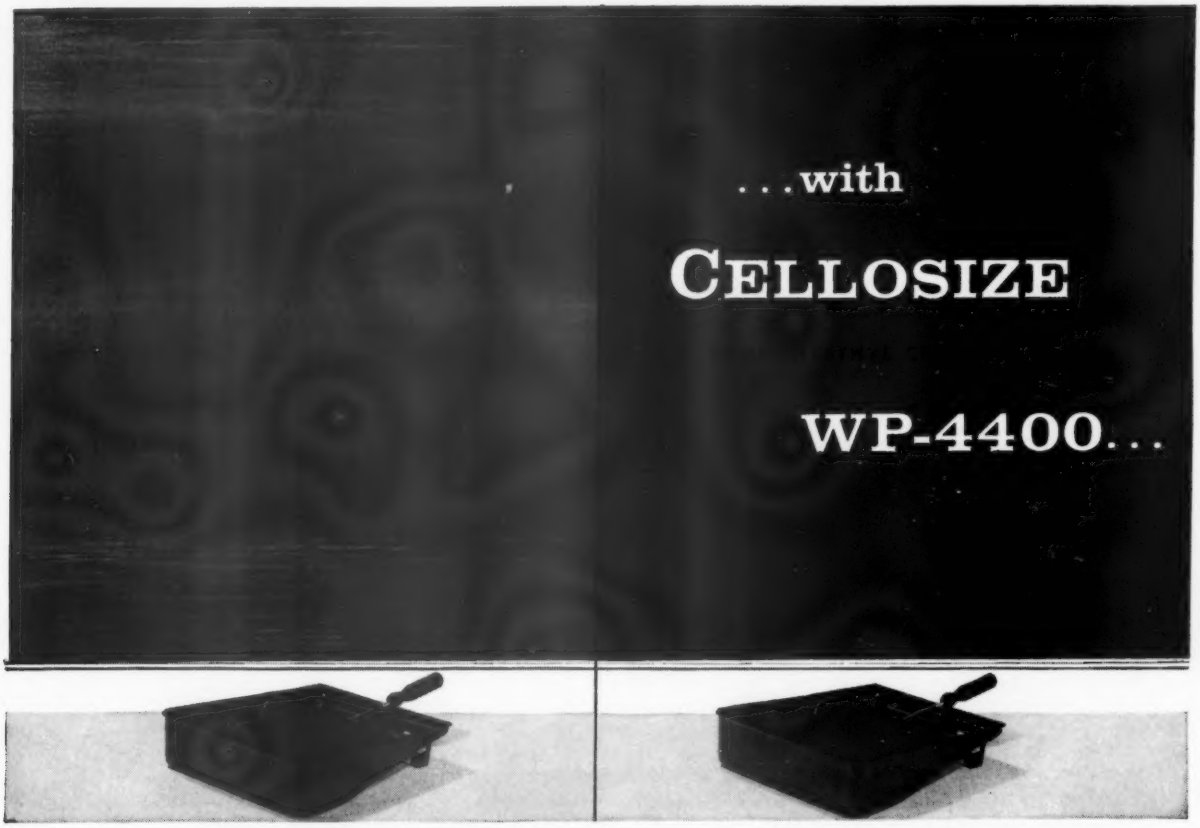

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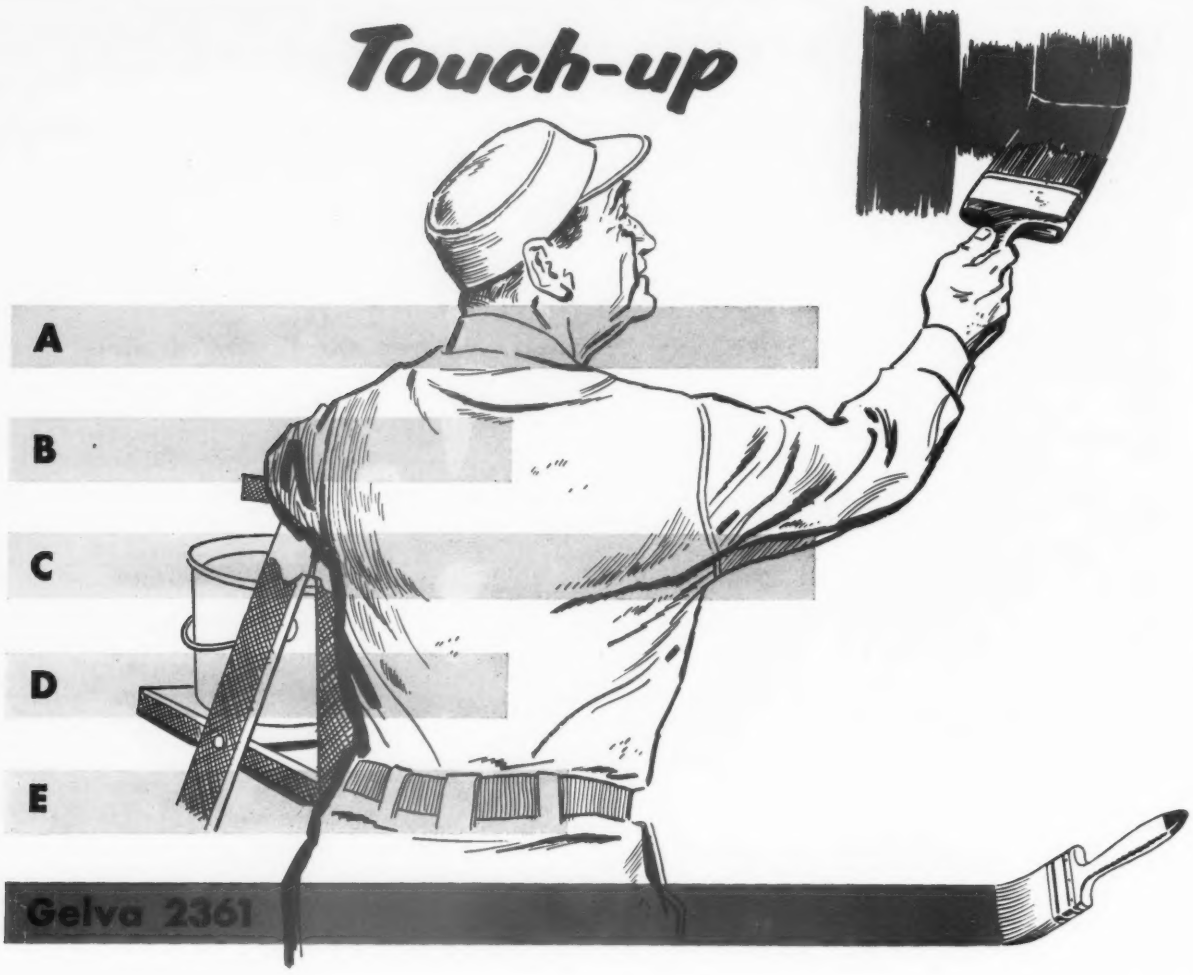

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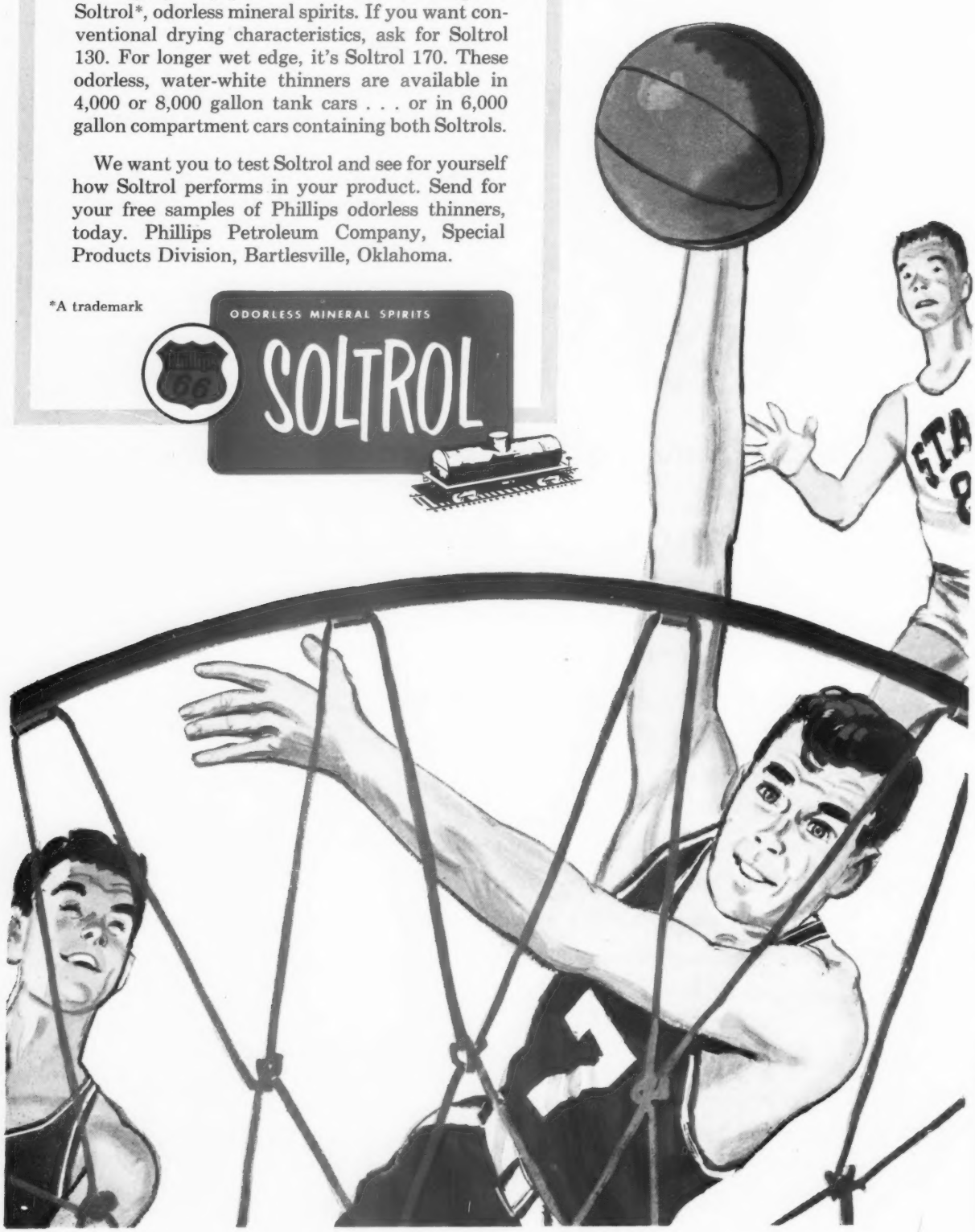

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POSITIVE DISPLACEMENT METERING

Provides Accurate Measurement in Paint and Varnish Processing

By
Paul Mankin*

ACCURATE measurement is a prime requirement of paint and varnish plant production. For metering solvents and thinners, for in-process measurement and metering finished products, positive displacement metering has become an increasingly important production tool. Where measurement of total liquid flow is required to accurately control processes, inventory and distribution, positive displacement metering provides the best known method of accurate measurement.

By carefully matching the metering installation to the process it serves, paint and varnish operators can gain additional dividends in rugged meter construction and long life. However, meter materials and the physical metering installation will vary according to the process. To gain maximum benefit from this accurate production tool, plant operators should be familiar with the concept of positive displacement metering, system installation and maintenance.

Meter Design

A positive displacement meter may be considered divided into two sections: a sealed-off section between inlet and outlet connections to isolate temporarily the incoming liquid stream, and a measuring chamber or chambers which are either liquid or mechanically sealed.

The meter operates on fluid pressure and it measures by liquid filling the measuring chamber—emptying, filling, emptying, and so on, ad infinitum. The capacity of the measuring chamber remains constant; obviously, if some device records the number of times the known volume of the measuring chamber is filled, the total flow through the meter may be obtained by simple multiplication. Although over-simplified, this is essentially what goes on.

In the measuring chamber, the incoming stream is divided into a number of equal volumes (the number varies with the type of meter). The liquid pressure from each volume pushes a piston, or

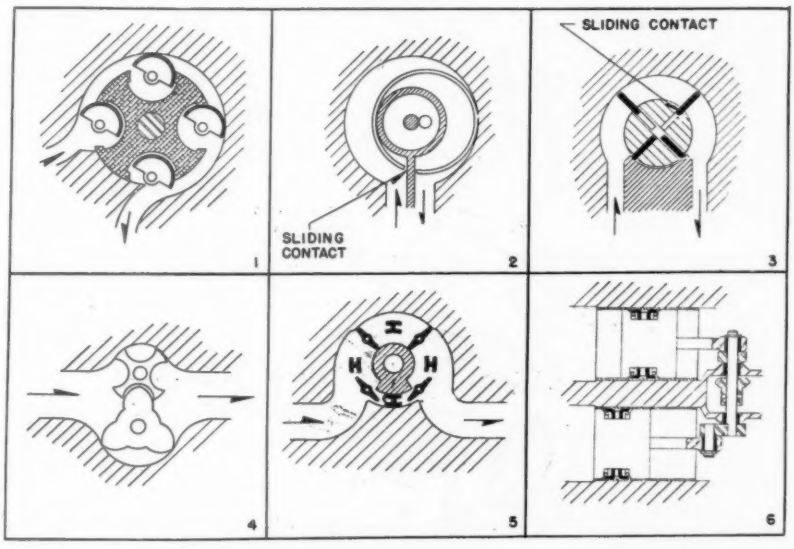

Figure 1. Typical types of positive displacements meters are (1) half-moon rotary, (2) oscillating piston, (3) sliding vane rotary, (4) two-spiral fluted rotor, (5) conventional vane rotary, (6) conventional piston.

*Chief Engineer, Rockwell Manufacturing Co.

vane, and then is discharged from the meter. Each push is transmitted through gearing to a counter. The counter totals the number of pushes continuously, and translates the sum into gallons (or other volumetric units).

All six principal types of meters commonly available—half-moon rotary, oscillating piston, sliding vane rotary, two-spiral fluted rotor, conventional vane rotary, and conventional piston—operate essentially in this fashion.

Meter Selection

Selection of the correct positive displacement meter for a specific application depends on certain characteristics of that application. The paint and varnish plant engineer should possess the following data before selecting a meter: the liquid to be metered; pressure at meter; viscosity or specific gravity; temperature of the liquid; whether the liquid is lubricating or non-lubricating, corrosive or non-corrosive; whether the liquid is free of foreign material or solids, if not, determine percentage and particle size if possible; degree of meter accuracy desired; maximum and minimum rate of flow; and pipe size.

The rate of liquid flowing through the meter dictates size. For example, the "Rotocycle" half-moon

Figure 2. The half-moon rotary type of positive displacement meter. Accuracy and repeatability are two of the most important characteristics of these meters. This meter repeats to the fourth place (.0025).

vane meter (Figure 2) is designed in various sizes to accomodate rates from 20 to 1000 gallons per minute and pressures from 125 to 1500 pounds per square inch.

Accuracy and repeatability are almost always important factors when it comes to selecting a meter for specific applications. In addition to their accuracy, the *repeatability* of positive displacement meters is excellent. The word "repeatability" is commonly used in the industry because the ability of a meter to repeat on pre-set volumes is of great importance on processing and marketing applications.

Materials of construction for the meters depend upon the corrosive properties of the liquid to be metered. For paints, meters of all-bronze construction are commonly used. Napthas are often measured in iron-cased meters with bronze chambers; light-weight aluminum pistons may be used in piston-type positive displacement meters. Meters used for turpentine are often iron-cased, with copper-free alloy chambers and pistons. However, it is always wisest for paint and varnish plant superintendents to send samples of the liquid and information concerning the proposed installation to the meter manufacturer. While corrosive properties of the liquid are an important consideration in specification, other physical factors may necessitate changes in construction or permit additional economy in installation.

Installation of System

Strainers, air eliminators and back-pressure and rate limit valves are commonly considered part of the metering installation, in addition to the meter proper. Plant process systems often make use of two additional accessories: multi-stage quantity control valves to shut off flow automatically at a predetermined volume, and temperature compensators, which insure registration of liquid volume automatically corrected to a specific base temperature.

Sometimes special accessories are used to "automate" the installation —for example, a register that rings a bell, buzzes a buzzer, lights a lamp, starts or stops pumps, indicates total flow remotely, or prints the flow to provide permanent records when certain quantities of liquid have been metered.

The strainer should be installed as near as possible to the inlet side of the meter. If it is impractical to install the strainer on the meter inlet, the piping between strainer and meter should be thoroughly cleaned before installing the meter in the system. This will prevent pipe scale, welding beads, etc. from entering the meter, which could cause malfunctioning.

The strainer basket should be

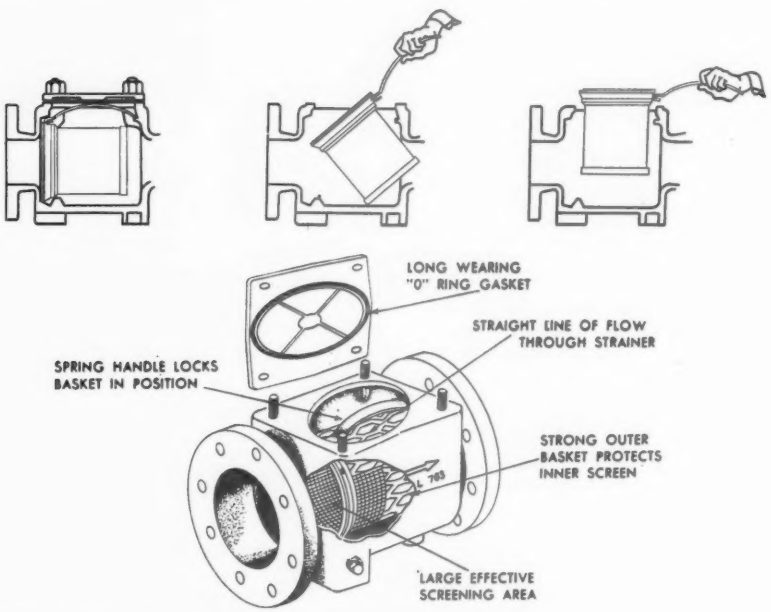

Figure 3. Line diagram of a strainer, an important part of meter installation. Strainers should be installed as near as possible to the inlet side of the meter.

cleaned frequently since a loaded strainer will reduce the rate of flow through the meter. The frequency of cleaning depends upon the amount and size of dirt or foreign particles being transferred in the system. On new systems it may be necessary to clean the strainer more frequently because welding scale and beads as well as dirt are commonly experienced.

Strainers are commonly designed to take less valuable space in the system and to make cleaning an easy task, as well as to simplify replacing an inexpensive basket.

An air eliminator is essential in many metering systems for the separation of air or vapor from the liquid. The passage of air or vapor through a meter will give false registration. The air eliminator should also be installed as close to the meter as possible. It should be adjacent to the meter, with the strainer separating the meter and air eliminator. The air vent line from the top of the air eliminator may be piped to the atmosphere; if liquid drippings are experienced from the air vent, the vent should be piped to an auxiliary tank or storage tank which is vented to atmosphere to collect the drippings.

Multistage quantity control valves, used in paint and varnish plants to shut off flow at a predetermined volume, consist of a multistage valve, latching devise and predetermining register. Closing automatically in three separate stages, the valve smooths out closing pressure and eliminates harmful hydraulic shock which can result from sudden shut-off.

Temperature compensators allow metered flow to be continuously recorded at the desired temperature point. A temperature bulb in the liquid stream senses temperature fluctuations which are transmitted by flexible tubing to a bellows on the meter head. Contraction and expansion of this bellows with temperature changes actuates the meter micro adjustment. This variable speed device regulates registration.

Post-Installation Procedure

After installing the metering equipment, all air should be purged from the system. The liquid and air should be allowed to proceed very slowly through the metering equipment until all air has been removed. This will prevent over speeding and shock to the meter. The air will over-speed the meter and shock will occur when solid liquid travelling at a high velocity enters the meter.

A positive displacement meter should not be operated beyond its rated capacity on any system unless approved by the manufacturer. The name plate on the meter clearly shows the rated capacity as well as the pressure rating. On some installations it may be necessary to retard flow so as not to exceed the maximum rated capacity of the meter. Should this be necessary, the device for regulating the flow, usually a rate limit valve, must be installed on the discharge side of the meter. The rate limit valve is designed to efficiently and economically protect the meter from over-speeding on liquid, and the valve is usually controlled by the line pressure.

Trouble-Shooting the System

Because of the important role that a meter plays in paint and varnish systems, it is advisable to have a workable and active preventative maintenance program. The loss of the services of a meter can prove expensive.

If a metering system fails to perform as designed, the natural tendency is to complain about the meter, and the common statement is usually "the meter is not measuring accurately". In the majority of cases the mal-performance of the meter is the result of misapplication, dirt in the system, improper sizing of auxiliary equipment, etc.

This is not to imply that meters will not fail or wear out. They will. But it is a good policy to assume the meter is giving good service and check other auxiliary equipment before checking the meter. The meter is a precision device and a lot of expense goes into the research, engineering, manufacturing and testing of each meter before it is delivered.

Possible meter difficulties include: under-registration, over-registration, reduced rate of flow, complete stoppage of both meter

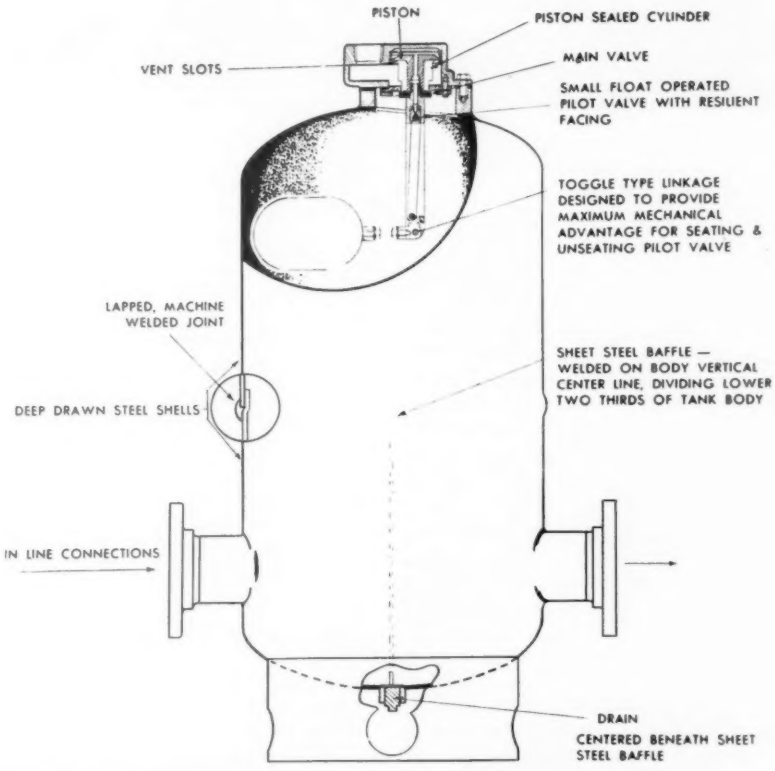

Figure 4. Air eliminators are an important part of the metering system. Installed adjacent to the meter, with strainer separating it from the meter, the air eliminator separates air or vapor from the liquid.

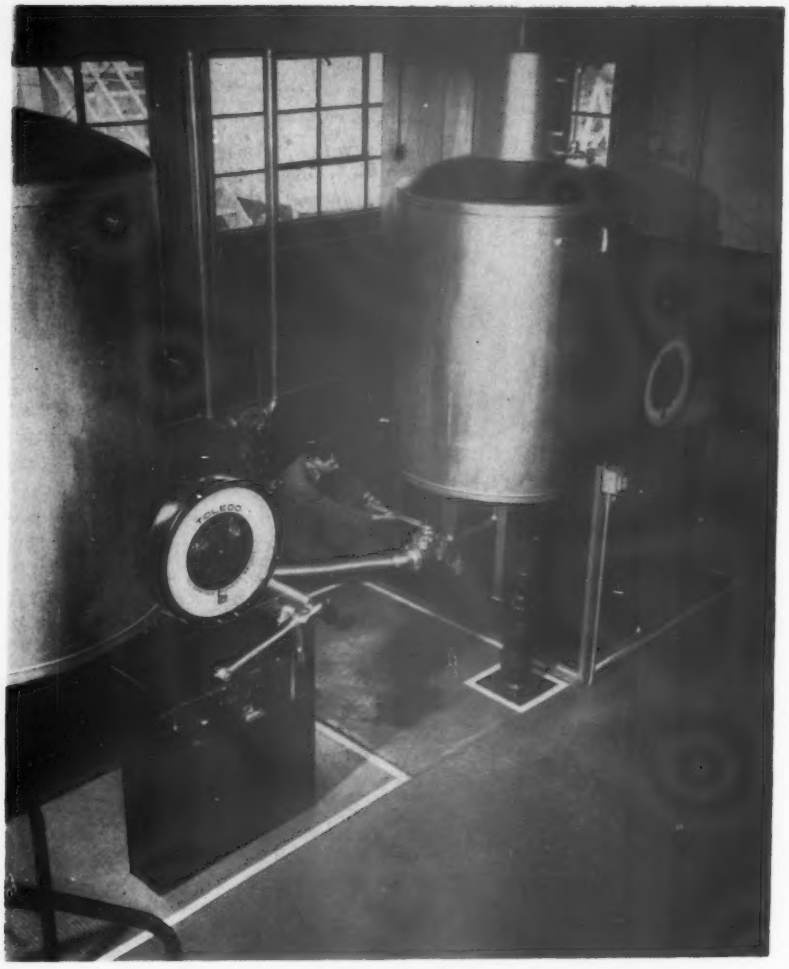

Figure 5. A test station meter proving system. For meter test, prover tank must be level and viscosity of test liquid should be very close, if not equal, to that of the metered product.

and liquid flow, stoppage of meter register but liquid still flowing.

Under-registration (the volume put through is greater than the amount recorded on the registering device) is the result of leakage around the sealing members of the measuring mechanism or of a faulty register. The leakage im most cases is caused by worn moving parts on meters with a service record. On new meters it could be caused by an extremely dry product or dirt build-up in moving parts which imposes a drag on the machines.

Over-registration (the volume put through is less than the amount recorded on the registering device) is not a frequent complaint but does happen on some installations.

As previously mentioned, the air and vapors must be separated from the product to assure accurate registration. If air and vapor are present, over-registration will result. This could be caused by a faulty air eliminator, plugged air eliminator vent line, restrictions in the system causing vaporization of the product, or by an erratic register or meter accuracy adjustment mechanism.

If the rate of flow reduces through the meter, check the system for restrictions: open air eliminator vent, badly worn meter or mechanical interference in the meter. The restriction could be a plugged strainer or pipe, partically closed valve, etc.

If complete stoppage of the meter and liquid is experienced, it is usually caused by a mechanical failure in the meter or meter supply. If the meter does not stop instantly but slowly, look for a faulty valve or a stop in the system for complete build-up of sediment. It is always a good policy to check supply volume.

Plant operators may at some time experience liquid flowing through the meter but the register is not recording. If this happens, look for a broken shaft, gear or pin in gear trains of the meter and register.

Test

It is important to periodically check the accuracy of all types of meters to determine if the meters are performing in accordance with their designed accuracy. A small error in measuring liquid entering a reaction vessel can result in a large dollar loss from bad product.

The two most commonly used systems for checking meter accuracy are the so-called permanent and portable systems. Both systems are currently in use for checking marketing and industrial meters. The permanent system is most common in industry and the portable system is most common in marketing. The portable system for marketing meters simulates very closely the conditions under which the product is normally delivered, while the permanent system in most cases more closely simulates industrial meter applications.

The prover tanks, whether permanent or portable, should be procured from tank manufacturers with the necessary experience. If manufactured by the user, they must be manufactured in accordance with proven designs. These tanks should be checked periodically for accuracy.

The size of the prover depends upon the meter size. The capacity should be equal to the maximum rate of flow of the meter for a duration of one minute. For example, if the maximum rate of the meter is 500 GPM, the prover tank should have a minimum capacity of 500 gallons.

Bottom filling prover tanks of large capacity give most efficient service, permitting faster filling, eliminating practically all foaming and keeping loss at a minimum.

AN EVALUATION OF ISOBUTYL ALCOHOL AND ITS ESTERS

Low-Cost Derivatives Show Solvent and Plasticizer Savings in Lacquer Formulations

By
J. D. Crowley*
and
T. E. Vance*

Since isobutyl alcohol and its derivatives, isobutyl acetate and di-isobutyl phthalate, have become available in ample quantities during the last few years, lacquer manufacturers are now able to evaluate the advantages of these materials in their formulations.

This article reviews their specifications, properties, and applications. It shows that an isobutyl derivative may be substituted directly for the corresponding butyl derivative in lacquer formulations and in polyvinyl acetate emulsion paints. Formulas showing the use of isobutyl alcohol and its esters in nitrocellulose and cellulose acetate butyrate lacquers for wood, steel, aluminum, and paper as well as in heat-sealing lacquers are given.

THE LACQUER industry has been enjoying a dependable source of isobutyl solvents at low cost since the "oxo" units of Texas Eastman Company went on stream in 1952. A relative newcomer in the petrochemical field, this company has been producing isobutyl alcohol as one of its major products, and has recently increased its production substantially. Since 1952, too, other large companies have introduced isobutyl production, thus assuring the market of a reliable and diversified source of supply of this material and its derivatives.

Cost, evaporation rate, solvent strength, odor, blush resistance, flow characteristics, and availability are factors that influence the selection of solvents for lacquers. Now, finally, with the two economic factors (cost and availability) satisfied by the assurance of a stable supply at competitive prices, the lacquer industry can realisticially evaluate the performance characteristics of isobutyl alochol and isobutyl acetate in their formulations.

*Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Co., Kingsport, Tenn.

Isobutyl alcohol has many properties which make it desirable as a lacquer component. It has a leveling effect on the evaporation rates of solvent mixtures, a property which promotes flow and retards blushing. This characteristic places the alcohol in a class with amyl alcohol.

Formulators who have marketed lacquers or made experimental lacquers with isobutyl acetate will remember that it is a medium-boiling solvent for uses demanding high solvency, good flow, and resistance to blushing. It closely parallels butyl acetate in all its properties except that it has a milder odor. Another advantageous difference is the slightly lower specific gravity of isobutyl acetate which can be translated into a saving for any customer buying by the pound and selling by the gallon. In a tank car of 60,000 pounds this would represent a bonus of 115 "free" gallons.

Di-isobutyl phthalate is being used to advantage in the United States as a replacement for dibutyl phthalate. The physical properties of the two esters are practically identical, the chief difference being that di-isobutyl phthalate has practically no odor. There is virtually no difference in the performance of the two esters as plasticizers.

Since these three materials have become increasingly important to the lacquer industry, individual discussions of their properties and usefulness follow.

ISOBUTYL ALCOHOL

Physical Properties

Isobutyl alcohol is a colorless

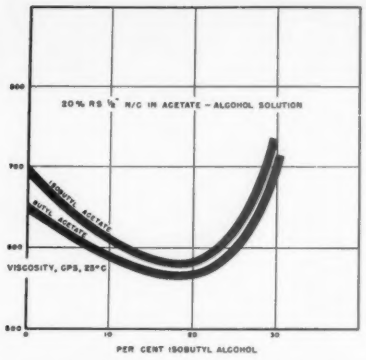

Figure 1. Effect of isobutyl alcohol on viscosity of nitrocellulose solutions.

liquid boiling about 10° C. below butyl alcohol and possessing a similar odor. Typical specification for Isobutyl Alcohol are given in Table 1.

Low-boiling alcohols when used as latent solvents, reduce viscosity but leave the film very rapidly. Medium-boiling alcohols such as isobutyl alcohol, also become active in the presence of aromatic solvents, ketones, and acetates but leave the film at a rate slowly enough to permit final flow out and blush retardation. Figure 1 shows the effect of isobutyl alcohol in reducing the viscosity of isobutyl and butyl acetate solutions of nitrocellulose. Minimum viscosity is obtained at 20 per cent alcohol concentration.

Figure 2 shows the retarding effect of isobutyl alcohol on the evaporation rates of medium-boiling ester solvents.

Replacement for Butyl Alcohol

Table 2 compares the physical properties of isobutyl and butyl alcohols.

Isobutyl alcohol can be used as a direct replacement for butyl alcohol in lacquers where the medium-boiling alcohol content does not exceed about 10%. If used in excess of this amount an increase in viscosity results. The formulation presented in Table 3 illustrates the direct replacement of butyl alcohol with isobutyl alcohol in a typical wood lacquer. These two lacquers have identical sprayability, flow, and resistance to blushing.

Color, APHA	5 max.
Specific gravity, 20°/20°C.	0.80210 - 0.80444
Assay	99% min.
Acidity, as acetic acid	0.005% max.
Boiling range	106° - 109°C.
Nonvolatile matter (per 100 ml.)	0.005 g. max.
Water	0.2% max.

Table 1. Typical specifications for isobutyl alcohol.

Property	Isobutyl Alcohol	Butyl Alcohol
Evaporation rate (butyl acetate = 1.0)	0.63	0.56
Flash point, Tag Open Cup, °C.	39	44
*Weight per U.S. gallon, 25°C., lb.	6.68	6.74
Boiling range, °C.	106 - 109	116 - 119

*Weight per Imp. gallon, 25°C., lb.; isobutyl alcohol = 8.02; butyl alcohol = 8.09
Weight per liter, 25°C., kilograms; isobutyl alcohol = 0.801; butyl alcohol = 0.808

Table 2. Comparison of physical properties of isobutyl and butyl alcohols.

	Isobutyl Alcohol	Butyl Alcohol
RS ½-second nitrocellulose	15	15
Maleic ester gum	7.5	7.5
Nonoxidizing alkyd (60%)	12.5	12.5
Dibutyl sebacate	2	2
Castor oil	2.5	2.5
Ethyl acetate	12	12
Butyl acetate	12.5	12.5
Isobutyl alcohol	8	—
Butyl alcohol	—	8
Toluene	28	28
	100	100
Nonvolatile, %	30	30
Viscosity, 25°C., poises	5.8	5.5
Nonvolatile at reduced viscosity, %	19.1	19.8
Viscosity of reduced lacquer, cps.	55	56

Table 3. Furniture finishes comparing isobutyl and butyl alcohols.

ISOBUTYL ACETATE

Physical Properties

Isobutyl acetate is a water-white liquid with a typical fruity ester odor which is milder than the characteristic odor of butyl acetate. Mild odor is a distinct advantage where vapor concentration may be high or where workers or occupants find strong-smelling solvents objectionable. Typical specifications for isobutyl acetate are given in Table 4.

Color, APHA	5 max.
Specific gravity, 20°/20°C.	0.864 - 0.871
Acidity, as acetic acid	0.01% max.
Boiling range	110° - 119°C.
Ester content	90% min.
Nonvolatile matter (per 100 ml.)	0.005 g. max.
Dryness	Miscible without turbidity with 19 vols. 60° A.P.I. gasoline at 20°C.

Table 4. Typical specifications for isobutyl acetate.

Isobutyl acetate is a medium-boiling solvent that can be used in place of butyl acetate, methyl isobutyl ketone, or sec-butyl ace-

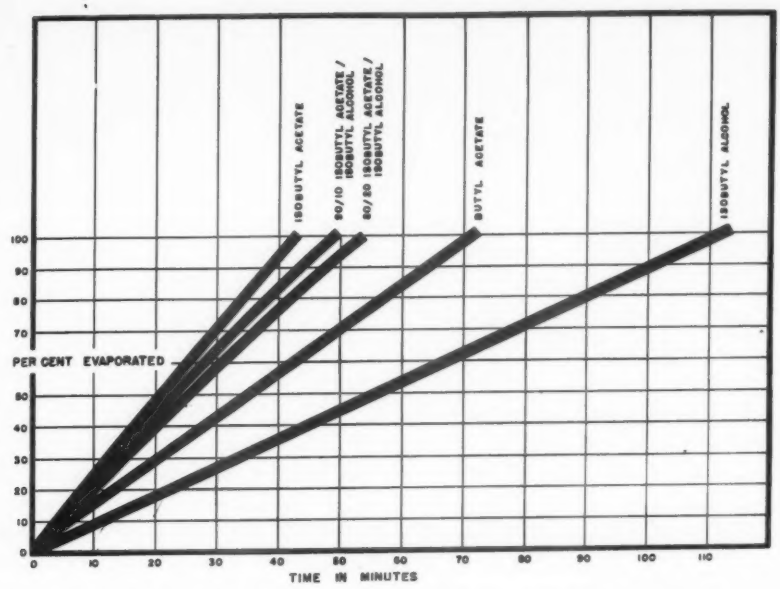

Figure 2. Effect of isobutyl alcohol in evaporation rates of medium-boiling solvents.

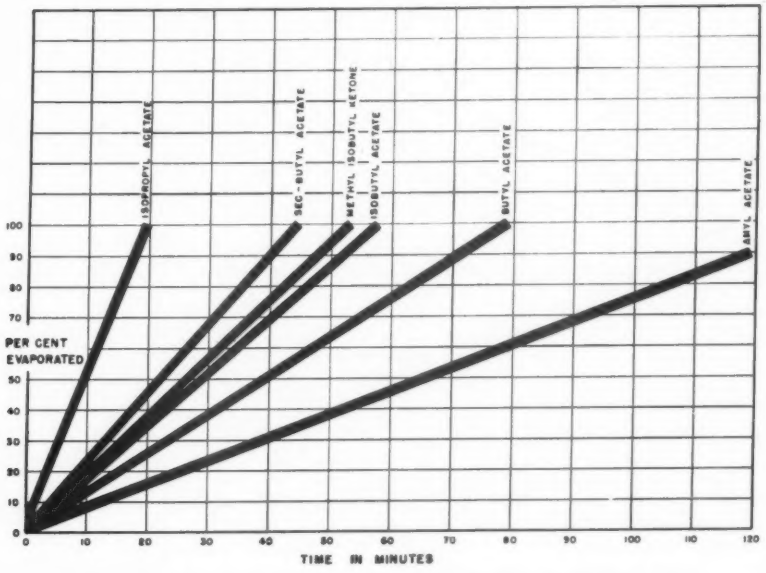

Figure 3. Evaporation rates of medium-boiling active solvents.

Property	sec-Butyl Acetate	Isobutyl Acetate	Butyl Acetate
Dilution ratio[a], toluene	2.6	2.84	2.96
VM & P naphtha	1.2	1.3	1.4
Specific gravity, 20°/20°C.	0.858	0.867	0.877
Evaporation rate[b]	1.8	1.4	1.0
Boiling range, °C.	104 - 125	110 - 119	118 - 128
Flash point, Tag Open Cup, °C.	29.4	30.6	32.2
Viscosity of 20% RS ½-second N/C solution, 25°C., cps.	810	790	755

[a] Dilution ratios were calculated at the point where the hydrocarbon content was just sufficient to cause heterogeneity in the solvent-nitrocellulose solution at 8% nitrocellulose concentration (A.S.T.M. D-268-46).

[b] Evaporation rates were determined by comparing the evaporation times of 5 ml. samples with the evaporation time of 5 ml. of butyl acetate under controlled conditions of temperature and humidity. [Ind. Eng. Chem., *28*, 312-6 (1936)].

Table 5. Comparison of physical properties of butyl acetates.

tate. These solvents are used where there is a demand for high solvency, good flow, and resistance to blushing. The physical properties of the butyl acetates usually used as lacquer solvents are compared in Table 5.

High solvency is desirable in a medium boiling lacquer solvent so that the film will level out to a smooth finish without blushing under conditions of high humidity. Isobutyl acetate has high solvency, as evidenced by its high dilution ratio and the low viscosity of nitrocellulose solutions.

Much significance has been attached to the boiling points and to the evaporation rates of solvents. Of the two, the evaporation rate is more important to the lacquer formulator. Figure 3 shows the relative evaporation rates of several medium-boiling active solvents. Isopropyl acetate and amyl acetate are shown for comparison.

Replacement for Butyl Acetate

When isobutyl acetate is used as a direct replacement for butyl acetate in a typical nitrocellulose lacquer, there is little difference in viscosity at 30% nonvolatile content. The same relationship holds true at spray viscosities. An example of such a replacement is shown in Table 6.

The sprayability, flow, and resistance to blushing of these lacquers were about the same and the films were comparable in hardness after 24 hours. However, the film cast from the lacquer containing isobutyl acetate required slightly less time to reach maximum hardness. Both lacquers gave clear films when sprayed at 27° C. and 75% relative humidity, and both blushed when sprayed at 27° C. and 80% relative humidity.

Evaporation Rates of of Mixtures

Various solvent mixtures giving the same evaporation rate as isobutyl acetate have been marketed; however, these mixtures do not give the same uniform "rate of evaporation" as isobutyl acetate. For example, a 60/40 mixture of butyl acetate and isopropyl acetate evaporates at a calculated rate of 1.4, the same as the rate of isobutyl acetate. Figure 4 shows the fallacy of using such a value.

The mixture has a greater tendency to cause blushing because, as the graph shows, the first 25% of the solvent evaporates at a rate of 2.4 and the first 50% at 1.9. The uniform evaporation rate of isobutyl acetate allows more time for flow with the same drying time.

DI-ISOBUTYL PHTHALATE

Physical Properties

Di-isobutyl phthalate is a low-cost plasticizer that can be substituted directly for dibutyl phthalate. For many purposes the di-isobutyl ester is preferred. It imparts better low-temperature flexibility to unmodified vinyl and nitrocellulose films and has a milder odor, usually being practically odorless. Specification of Di-Isobutyl Phthalate are presented in Table 7.

This plasticizer differs only slightly in its physical properties from the butyl derivative, as shown in Table 8.

Application in Furniture Finishes

As might be expected from the lower boiling point of di-isobutyl phthalate, a nitrate film containing this ester showed greater loss on heating than a similar film containing dibutyl phthalate. Certain resins, such as Amberol 801, a maleic ester gum, retard the loss of plasticizer. Weight losses determined at 71° C. and 104° C. on low-cost wood lacquers plasticized with di-isobutyl phthalate and with dibutyl phthalate are shown in Figure 5. The wood lacquer formula used with each plasticizer was as follows:

Component	Amount, %
RS ½-second nitrocellulose	14.5
Maleic ester gum	15
Plasticizer	5
Isobutyl acetate	12.5
Ethyl acetate	12
Isobutyl alcohol	8
Toluene	33
	100.0
Nonvolatile, %	30.2

Even though di-isobutyl phthalate showed slightly greater volatility at elevated temperatures, no difference could be detected in the actual performance of the two plasticizers. Flexibility, cold check

	Isobutyl Acetate	Butyl Acetate
RS ½-second nitrocellulose	15	15
Maleic ester gum	7.5	7.5
Nonoxidizing alkyd (60%)	12.5	12.5
Dibutyl sebacate	2	2
Castor oil	2.5	2.5
Ethyl acetate	12	12
Isobutyl acetate	12.5	—
Butyl acetate	—	12.5
Butyl alcohol	8	8
Toluene	28	28
	100.0	100.0
Nonvolatile, %	30	30
Viscosity, 25°C., poises	5.5	5.5
Nonvolatile at reduced viscosity, %	19.87	19.86
Viscosity of reduced lacquer, cps.	56	56

Table 6. Furniture finishes comparing isobutyl and butyl acetates.

Color, APHA	10 max.
Specific gravity, 20°/20°C.	1.038 - 1.042
Acidity, as phthalic acid	0.01% max.
Ester content	99% min.
Filter paper test	No more color than standard
Appearance	Free from insoluble matter and haze

Table 7. Typical specifications for di-isobutyl phthalate.

Property	Di-Isobutyl Phthalate	Dibutyl Phthalate
Boiling point, °C.	290	320
Freezing point, °C.	–64	–35
Flash point, °C., Cleveland Open Cup	174	185
Weight per imp. gallon, 25°C., lb.	10.39	10.50
Weight per liter, 25°C., kilograms	1.04	1.05
Weight per U. S. gallon, lb. at 25°C.	8.66	8.75
Odor	None	Very slight

Table 8. Comparison of physical properties of di-isobutyl and dibutyl phthalates.

	Paper Lacquer	Furniture Lacquer	Metal Lacquer	Heat-Sealing Paper Lacquer	Hot-Spray Wood Lacquer
RS ½-Second nitrocellulose (70%)	18	14.5	18		13.5
SS ½-Second nitrocellulose (70%)				17	
Santolite MHP	8			3.5	
Duraplex ND-77B (60%)			20		11.25
Dammar (dewaxed)				3	
Amberol 801		20			6.75
Paraffin wax				1	
Castor oil					2.25
Di-isobutyl phthalate	7	5	5	5	1.75
Dicyclohexyl phthalate				4.5	
Ethyl alcohol	6.5			6.5	2.5
Isobutyl alcohol	6.5	8	8	6	7.5
Ethyl acetate	6.5	9	8	6	
Isobutyl acetate	13.5	12.5	12.5	13.5	22.5
Amyl acetate					7.5
Toluene	34	30	28	34	
Xylene					24.5
	100.0	100.0	100.0	100.0	100.0
Nonvolatile, %	27.6	35.1	29.5	23.5	27
Viscosity, cps. at 25°C.	408	490	870	148	327 (75 cps./ 71°C.)

Table 9. Nitrocellulose lacquers containing isobutyl derivatives.

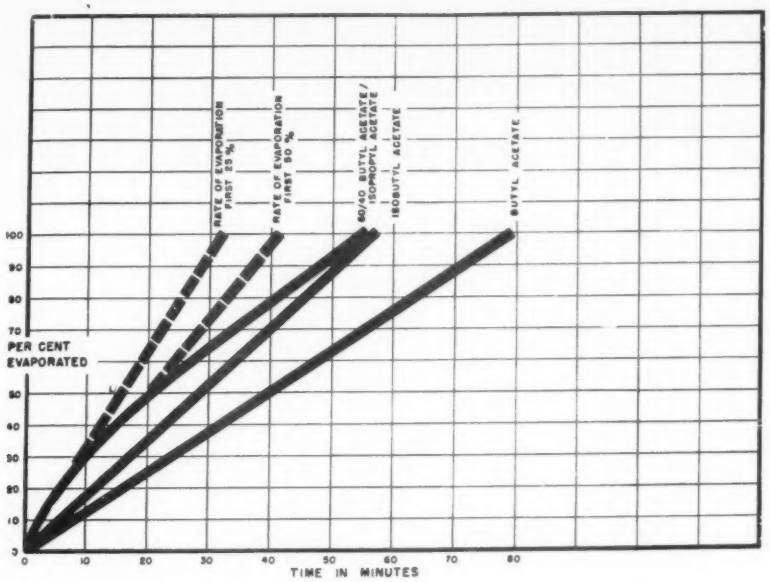

Figure 4. Evaporation rates of isobutyl acetate and isopropyl acetate-butyl acetate blends.

	Paper Lacquer	Aluminum Lacquer	Heat-Sealing Paper Lacquer	Wood Lacquer
Half-Second Butyrate	14	12.2	15	12
FCD 555B (50%)		2.7		
Dow 276-V9				4.5
Arochem 650				6
Amberol 820	11.5			
Tricresyl phosphate	4.5			
Santolite MHP			15	
DC 200 (1000 cs.)		0.01		0.02
Ethyl acetate				11
Isobutyl acetate	20	21	10	15.68
Ethyl alcohol, 95%	10	6	10	8
Isobutyl alcohol	10	6	10	3.8
Toluene	30	37.09	40	39
Xylene		6		
Hi-flash aromatic naphtha		9		
	100.0.0	100.0	100.0	100.0
Nonvolatile, %	30	13.56	30	22.61
Viscosity, cps. at 25°C.	220	55	270	65
Remarks	Roll coat Bake for 15 sec. at 150°C.	For foil add 1.8 parts Paraplex G-50	Roll coat	Spray application

Table 10. Typical cellulose acetate butyrate lacquers using isobutyl derivatives.

resistance, hardness, and time to reach maximum hardness appeared to be the same for both films.

Use in PVAc Emulsion Paints

Di-isobutyl phthalate is being used in polyvinyl acetate emulsion paints instead of dibutyl phthalate because of its good performance and economy. When compared with dibutyl phthalate in such formulations, no difference could be detected in properties of the paints or of the dry films. Freeze-thaw cycles of the paints were comparable and viscosity increase was no greater than when dibutyl phthalate was used. Also, the

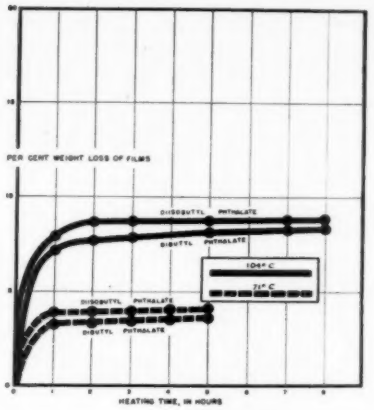

Figure 5. Loss of plasticizer on heating nitrocellulose films.

films had the same hardness and the same resistance to scrubbing and water spotting.

Typical Formulas Based On Isobutyl Derivatives

Nitrocellulose Lacquers

Nitrocellulose lacquers require up to 20% medium-boiling active solvent to provide adequate flow out properties and to prevent blushing. Hot-spray lacquers require even more because of the large amount of volatile solvents that are lost between the spray gun and surface. Table 9 illustrates the use of isobutyl alcohol and its esters in five typical nitrocellulose lacquers:

Cellulose Acetate Butyrate Lacquers

Cellulose acetate butyrate is gaining in popularity because of its resistance to weathering and discoloration, low degree of flammability, and nongelling properties in contact with metal powders. For spray application, the solvent composition is similar to that used with nitrocellulose except that a larger percentage of the solvent may be hydrocarbon-alcohol under ideal coating and drying conditions; for instance, the paper lacquer given below may be coated from an 80/20 toluene/ethyl alcohol solvent composition. However, isobutyl acetate is necessary for promoting optimum flow. Di-isobutyl phthalate is used with cellulose acetate butyrate in limited amounts because of its high plasticizing activity. Formulation of various cellulose acetate butyrate lacquers employing isobutyl derivatives are given in Table 10.

(*Turn to page 99*)

CELLULOSE DERIVATIVE-SOLVENT INTERACTION

By
W. R. Moore*

IN MANY industrial applications of cellulose derivatives, such as varnishes and other coatings, the derivative is used in solution. The factors which determine whether a cellulose derivative will dissolve in a particular liquid and the principles governing such solution properties as diluent tolerance and viscosity are therefore of considerable importance. Cellulose derivatives are substances of very high molecular weights with very long linear chain-molecules, belonging to the class of substances termed high polymers. The principles governing the interaction of flexible and relatively non-polar polymers with liquids are well known and in recent years theories accounting successfully for such interaction have been developed. Although cellulose derivatives differ from flexible and non-polar polymers in certain important respects the consideration of such theories is of value as a preliminary to the consideration of cellulose derivative-solvent interaction.

Polymer-Liquid Interaction Theory

Solution will only occur when there is a decrease in the Gibbs Free Energy of the solute-solvent system as a whole. The change in Gibbs Free Energy, $\triangle F$, can be expressed in terms of the corresponding heat, $\triangle H$, and entropy, $\triangle S$, changes by

$$\triangle F = \triangle H - T\triangle S$$

where T is the absolute temperature. Theoretical calculations of $\triangle H$ and $\triangle S$ by Huggins[1] and Flory[2] have lead to the use of a free energy parameter, called μ by Huggins and χ by Flory, which characterises a polymer-liquid system. Although semiempirical in nature, χ represents our best measure of solvent power in a thermodynamic sense. For systems involving flexible, relatively non-polar polymers it has values between 0.3 and 0.5. The smaller the value the better the solvent thermodynamically. If χ is greater than approximately 0.5 the polymer will not dissolve in the liquid and will only swell. χ can be written as the sum of heat and entropy contributions by

$$\chi = \chi_s + \chi_h$$

In cases where polymer and solvent mix with absorption of heat the heat contribution χ_h may be expressed as

$$\chi_h = KV_1(\delta_1 - \delta_2)^2/RT$$

where K is a constant, generally assumed to be unity, and δ_1 and δ_2 are the solubility parameters of solvent and polymer. δ is equal to $[(L_e - RT)/V]^{\frac{1}{2}}$ where L_e is the latent heat of vaporisation and V the molar volume, both at the absolute temperature T. If χ_s does not vary much with solvent the difference between δ_1 and δ_2 will largely determine the value of χ which will be least when δ_1 equals δ_2. In other words, the best solvent will be that whose solubility parameter is closest to that of the polymer. If δ_1 differs sufficiently from δ_2 χ may be greater than 0.5 and solution will not occur. A given polymer will therefore only dissolve in liquids whose solubility parameters lie within a certain range which is about $\delta_2 \pm 1.1$. In a range of solvents whose solubility parameters differ within these limits any measure of polymer-solvent interaction should vary with solvent δ in the manner shown in Figure 1, a maximum being reached when $\delta_1 = \delta_2$.

Solvation

In the theory outlined above it is assumed that the polymer chains are flexible and that polymer and solvent mix with absorption of heat. Neither assumption is true in the case of cellulose derivatives, the chains of which are stiff and which mix with evolution of heat. Heat evolution is a consequence of solvation—specific interaction between polar groups of solvent and polar groups, substituted ester and ether or unsubstituted hydroxyl, of the derivative—causing more or less firm binding of solvent to polymer. There is ample evi-

*This article is based on a lecture given by Mr. Moore at the Gordon Research Conference on Organic Coatings, New Hampton, N. H., July 18, 1956. Mr. Moore is associated with the Technical College, Bradford, England.

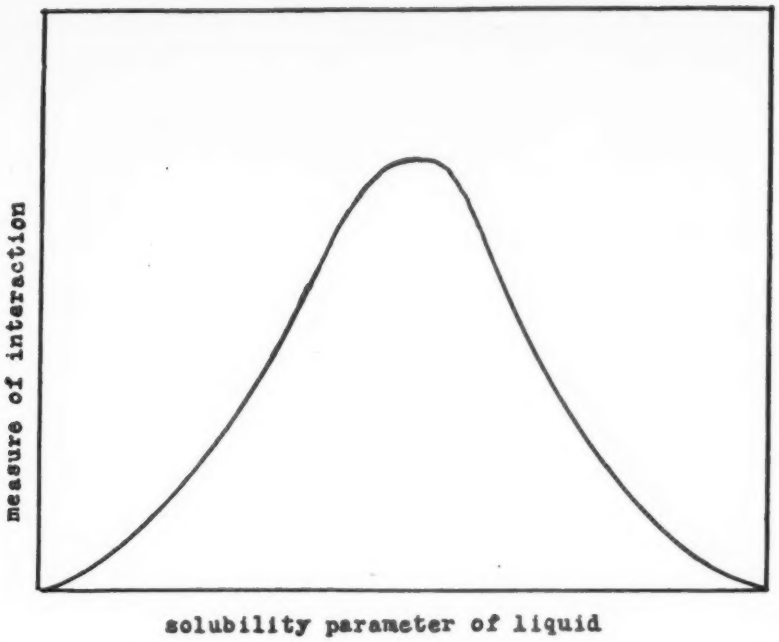

Figure 1. Polymer-solvent interaction as a function of solubility parameter of solvent.

dence[3,4,5] for solvation, which often appears to involve hydrogen bonding, but the number of solvent molecules bound to each glucose residue is often doubtful. Many experimental studies[6-10] suggest from 2 to 6 but larger numbers have been suggested.[11] Firm binding of large numbers seems unlikely but some propagated attraction is possible.[12]

Solvation, by itself, does not cause solution. A solvent must not only solvate the derivative but also dissolve the solvated polymer. Solvation will render the derivative less polar and although the solvated derivative will vary somewhat with solvent it might be expected that the requirements of solvents for less polar polymers would apply, in some degree, to those for cellulose derivatives. Spurlin,[13] regarding solvation as acid-base interaction, says that solvents must be acidic or basic and also possess an appropriate solubility parameter. This seems to be the case with solvents for secondary cellulose acetate which have solubility parameters within the range 9.5 to about 13. Solvents for commercial ethyl cellulose have δ values between about 8.2 and 12. The rather wider range, compared with that for less polar polymers, reflects the influence of varying solubility parameter of solvated polymer. It is found that certain measures of polymer-solvent interaction, such as the volume of hexane required to cause precipitation from solution[14] and swelling in solvent/non-solvent mixtures[15] vary, in the case of cellulose nitrate, with solvent δ in the manner illustrated in Figure 1.

It might be expected that, if solvation and stiffness of chains are taken into account, it should be possible to interpret solution properties of cellulose derivatives in terms of the theories applying to less polar and more flexible polymers. It is of particular interest to compare the values of suggested measures of solvent power for cellulose derivatives, obtained from precipitation and viscosity measurements, with thermodynamic estimates obtained from values of χ. With these aims in view, we may consider the results of some experimental studies on dilute solutions of a 12.5% N cellulose nitrate, a secondary cellulose acetate of 54.7% acetic acid yield and an ethyl cellulose of 48.7% ethoxyl content. These three derivatives, all of which are used industrially, are of similar degree of substitution and molecular weight (50,000 to 100,000).

Osmotic Pressure Studies

Osmotic pressure (π) measurements are illustrated in Figures 2-5 by plots of π/c against concentration (c) for a temperature of 25° C. The variation of π/c with c is given by

$$\pi/c = RT/M + RT(\tfrac{1}{2} - \chi)c/V_1 d_2^2$$

where M is the molecular weight of the polymer, d_2 its density, and V_1 the molar volume of solvent. Generally, the plots are linear and extrapolate to essentially the same point, for a particular derivative, at zero concentration, implying molecular dispersion of polymer. The curved plots for ethyl cellulose in benzene and toluene, how-

Solvent	Cellulose nitrate	Cellulose acetate	Ethyl cellulose	δ_1
acetone	0.27	0.45	0.46	9.76
methyl ethyl ketone	0.21		0.42	9.15
methyl n-propyl ketone	0.15		0.37	8.84
methyl n-amyl ketone	0.02		0.38	8.45
methyl n-hexyl ketone	0.16			8.35
methyl acetate	0.30	0.46	0.41	9.55
ethyl acetate	0.22		0.40	9.05
n-propyl acetate	0.13		0.33	8.75
n-butyl acetate	0.015		0.24	8.53
n-amyl acetate	0.02		0.28	8.45
chloroform			0.34	9.30
carbon tetrachloride			0.46	8.60
benzene			0.48	9.15
toluene			0.47	8.90
pyridine		0.28		10.40
α-picoline		0.36		9.60
β-picoline		0.285		10.00
γ-picoline		0.26		10.00
nitromethane		0.44		12.6
aniline		0.38		10.8
dioxan		0.38		10.0

Table 1. Values of χ and δ_1

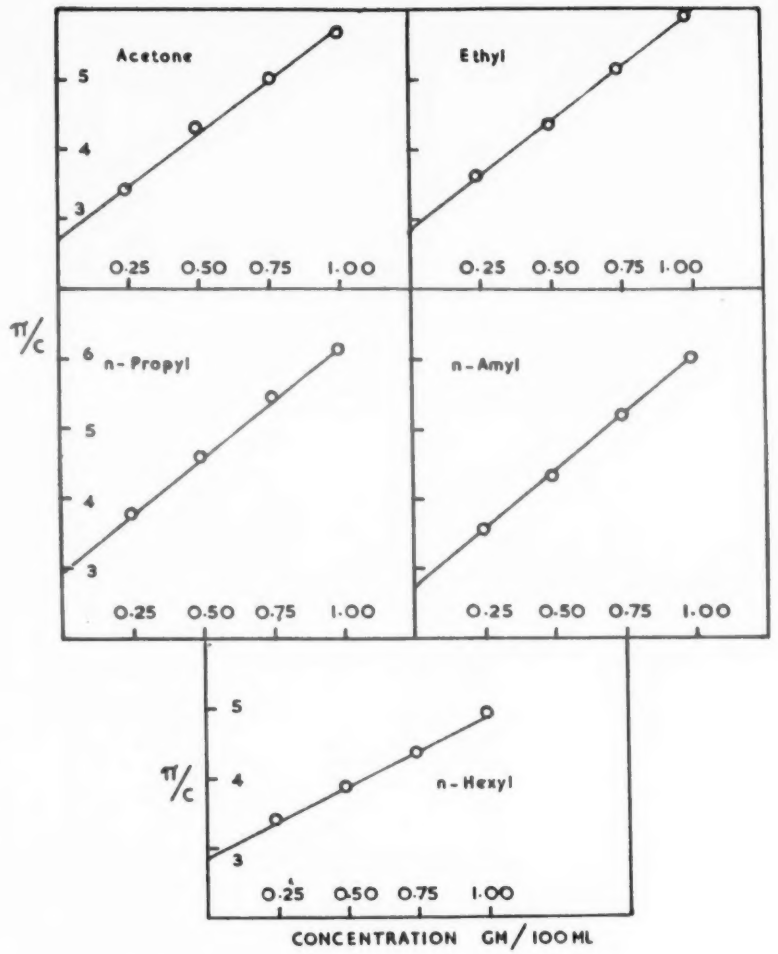

Figure 2. π/C against c plots. Cellulose nitrate in methyl ketones (25°C).

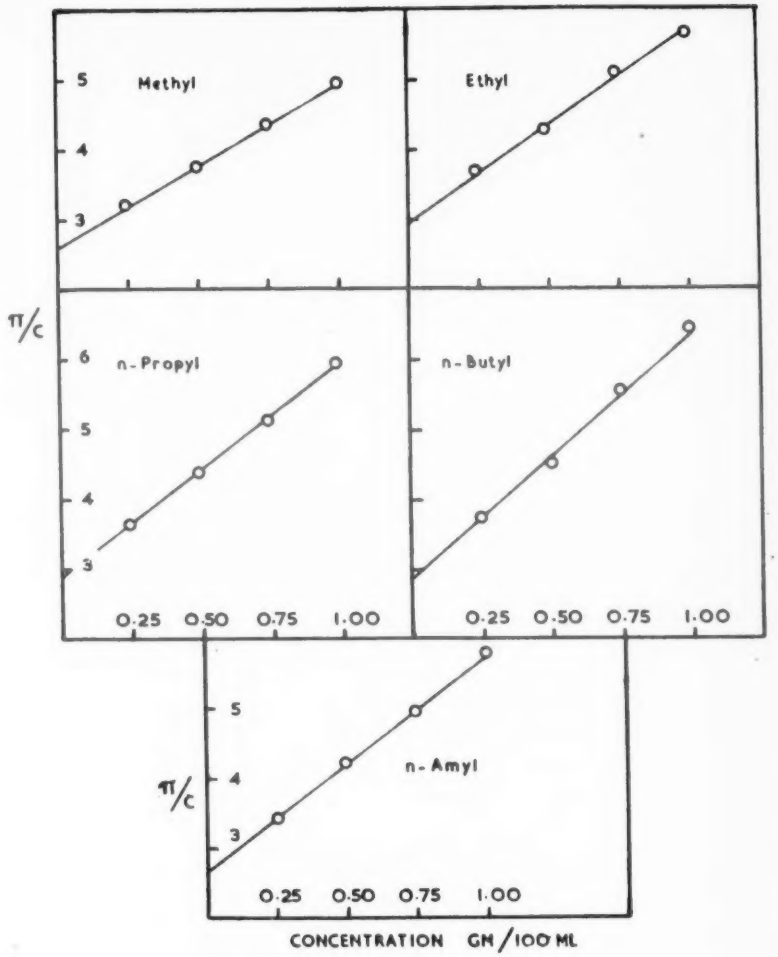

Figure 3. π/C against c plots. Cellulose nitrate in alkyl acetates (25°C).

ever, suggest association.[16] Values of χ can be obtained from the slopes of such plots and are given, for a number of polymer-solvent systems involving the three derivatives, in Table 1. The values of χ are all positive. On ascent of each of the homologous series of solvents for cellulose nitrate and ethyl cellulose the value of χ seems to fall to a minimum and then increase.

Positive values of χ are, at first sight, surprising since cellulose derivatives and solvents mix with evolution of heat. Since

$$\chi = \chi_s - \chi_h$$

and χ_s, because of solvation and stiffness of chains is likely to be small, a negative χ_h would be expected to give low and negative values of χ. Calorimetric studies,[8] however, show that solution involves at least two processes. Heat evolution in solvation is followed by heat absorption in solution of the solvated derivative. Both processes will contribute to χ_h and the combined effects of the entropy and heat absorbed contributions may give positive values of χ. If χ_s and the contribution due to heat evolution do not vary much within a homologous series of solvents the contribution from heat absorbed will largely govern the variation of χ within the series. This latter contribution would be expected to depend on $(\delta_1 - \delta_2)^2$, where δ_2 is the solubility parameter of the solvated polymer. If δ_2 does not vary greatly within the series the interaction will largely depend on the value of δ_1. With cellulose nitrate and ethyl cellulose χ seems to be least, in each series of solvents, when the value of δ_1 is between 8.4 and 8.8.

Precipitation from Solution

The volume of non-solvent liquid which is required to cause precipitation from solution is often used as a measure of solvent power. Although this method gives important information regarding the ability of solutions to tolerate additions of diluents, its value as a means of estimating solvent power, in a thermodynamic sense, is often doubtful. Different precipitant liquids may give different orders of solvent power in a range of solvents. In certain cases, addition of diluent may initially cause an

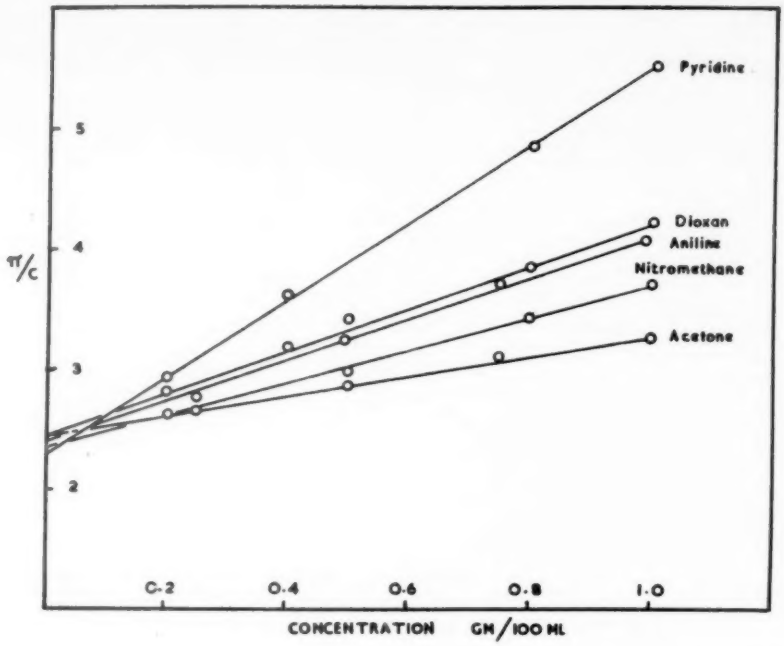

Figure 4. π/C against c plots. Secondary cellulose acetate in representative solvents (25°C).

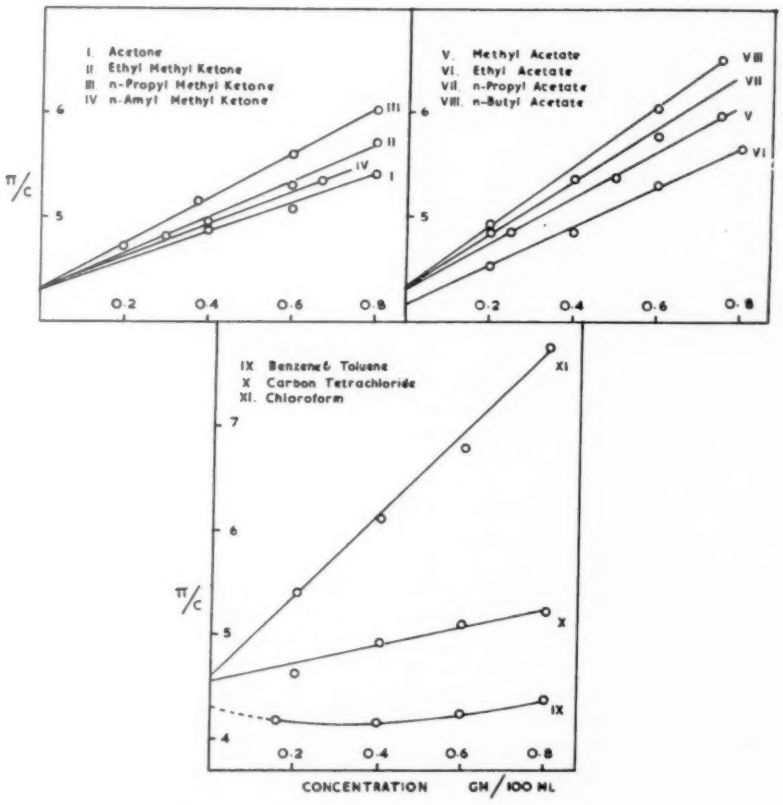

Figure 5. π/C against c plots. Ethyl cellulose in representative solvents (25°C).

Solvents	CELLULOSE NITRATE		CELLULOSE ACETATE			ETHYL CELLULOSE
	Hexane	Toluene	Hexane	Toluene	Ethanol	Hexane
acetone	4.16	37.2	0.49	2.80	4.65	12.25
methyl ethyl ketone	5.05	32.0				9.4
methyl n-propyl ketone	5.87	30.0				7.3
methyl n-amyl ketone	7.19	24.5				4.45
methyl n-hexyl ketone	7.12	15.6				
methyl acetate	3.90	15.6	0.30	0.83	4.30	11.55
ethyl acetate	6.00	18.8				8.8
n-propyl acetate	7.01	18.2				7.8
n-butyl acetate	7.79	16.5				7.3
n-amyl acetate	7.46	14.35				4.75
chloroform						19.3
carbon tetrachloride						0.87
benzene						2.3
toluene						1.45
pyridine			2.13	6.80	5.70	
α-picoline			1.15	3.23	3.15	
β-picoline			2.02	6.10	4.5	
γ-picoline			2.16	6.95	4.0	
nitromethane			—	1.85	7.55	
aniline			—	4.44	9.35	
dioxan			0.75	1.60	5.40	

Table 2. Volumes of precipitants.

increase in solvent power.[13] Table 2 gives the volumes of different precipitants which when added to 5 mls of solution just cause precipitation of polymer at 25° C. The initial polymer concentrations were such that the same concentrations (0.25%) were obtained at the precipitation point. In the case of cellulose nitrate the variations of the volumes of hexane and toluene in each of the homologous series are similar to those reported by Doolittle.[17] With ethyl cellulose the volume of hexane decreases on ascent of each series and the poor non-polar solvents carbon tetrachloride, benzene and toluene require only small volumes. With cellulose acetate, the volumes of hexane and toluene place the solvents in the same order, although those of toluene are larger. The order with ethanol is quite different. Comparison of the volumes of precipitants with the appropriate values of χ shows that hexane places the solvents for cellulose nitrate in approximately the correct order of thermodynamic solvent power but that toluene does not. Both hexane and toluene give approximately the correct order for cellulose acetate but ethanol does not. The volumes of hexane are clearly not a measure of solvent power for ethyl cellulose.

The interpretation of these results is helped by consideration of the values of δ_m, the solubility parameter of the solvent/precipitant mixture at the precipitation point, which may be calculated from

$$\delta_m = \delta_p\phi_p + \delta_1\phi_1$$

where p prefers to precipitant and ϕ to volume fraction. Values of δ_m are given in Table 3. With hexane as precipitant for cellulose nitrate they decrease on ascent of each homologous series of solvents. Similar behaviour is seen with toluene but values are larger and the decrease smaller. In the case of ethyl cellulose there is a small decrease on ascent of each series and the non-polar solvents give a larger and almost constant δ_m. Values for cellulose acetate with hexane as precipitants are not very different and, except in the case of nitromethane, do not vary much with solvent. Values with ethanol are larger and more variable.

Precipitation should occur when δ_m differs sufficiently from δ_2 to cause χ to just exceed the critical value of ca 0.5. If the entropy contribution to χ is small and does not vary much with solvent δ_m should depend on δ_2 and, for a particular polymer, apart from the effect of molar volume, be largely independent of solvent. Solvation will modify this. Addition of precipitant may cause desolvation[17] or solvated polymer may precipitate. The results of studies of absorption of solvent from solvent-hexane mixtures by cellulose nitrate[18] and acetate[19] suggest that solvated polymer precipitates. If so, δ_2 will refer to solvated polymer and might be expected to vary with solvent. The decreases in δ_m observed on ascent of the homologous series are consistent with precipitation of solvated polymer. The larger values obtained with toluene as precipitant for cellulose nitrate may be due to precipitation of a differently solvated polymer than that precipitated by hexane. There is evidence[20,21] that aromatic hydrocarbons can solvate the highly polar nitrate and the toluene may compete with solvent in solvation. The larger, almost constant δ_m obtained with the non-polar solvents for ethyl cellulose probably results from separation of unsolvated polymer since, solvation, in these solvents, is improbable. The similar values obtained with hexane and toluene as precipitants for cellulose acetate may result from precipitation of solvated or desolvated polymer. The former, with hydroxyl groups solvated by basic solvents[3], is perhaps more likely. The large values of δ_m observed with ethanol as precipitant are due, in part, to its high solubility parameter (13.1). Addition of ethanol will cause precipitation when δ_m becomes sufficiently greater than δ_2 whereas with hexane and toluene, with low solubility parameters (7.4 and 8.9), precipitation will occur when δ_m is sufficiently less. It should be

Solvent	CELLULOSE NITRATE Hexane	CELLULOSE NITRATE Toluene	CELLULOSE ACETATE Hexane	CELLULOSE ACETATE Toluene	CELLULOSE ACETATE Ethanol	ETHYL CELLULOSE Hexane
acetone	8.69	9.01	9.53	9.45	11.38	8.01
methyl ethyl ketone	8.27	8.94				7.94
methyl n-propyl ketone	8.06	8.89				7.93
methyl n-amyl ketone	7.83	8.82				7.91
methyl n-hexyl ketone	7.79	8.72				
methyl acetate	8.61	9.06	9.41	9.45	11.19	7.99
ethyl acetate	8.15	8.95				7.93
n-propyl acetate	7.96	8.87				7.86
n-butyl acetate	7.84	8.81				7.83
n-amyl acetate	7.82	8.79				7.79
chloroform						7.71
carbon tetrachloride						8.58
benzene						8.55
toluene						8.54
pyridine			9.41	9.48	11.84	
α-picoline			9.21	9.33	11.98	
β-picoline			9.50	9.57	11.68	
γ-picoline			9.32	9.44	11.51	
nitromethane			—	11.60	12.42	
aniline			—	9.93	12.30	
dioxan			9.43	9.52	11.61	

Table 3. Values of δm

noted, however, that the solubility parameter of ethanol will include a large contribution from association forces, since ethanol is associated. To what extent such forces will persist in the mixtures is unknown and for this reason the δ_m values must be regarded as doubtful. The same may apply to the value for the nitromethane-toluene mixture, the components of which may interact inductively.

If certain assumptions are made, estimates of δ_2, the solubility parameter of the polymer which precipitates, are possible. At the precipitation point $\chi = 0.5$. If solvated polymer and mixture mix with absorption of heat, then, to the approximation that the mixture can be regarded as a single liquid, we may write

$$0.5 = \chi_s + KV_m(\delta_m - \delta_2)^2/RT$$

where V_m, the molar volume of the mixture, is given by

$$V_m = V_1V_p/(\phi_1V_p - \phi_pV_1)$$

where V refers to molar volume. K may be taken as unity. If the value of χ_s is known, δ_2 can be calculated. χ_s is likely to be small and lattice theory suggests a value of 0.12.[22] Using this value in all cases and the δ_m values in Table 3 we obtain the δ_2 values in Table 4.

The values for cellulose nitrate precipitated by hexane decrease markedly on ascent of each series of solvents, as perhaps is to be expected if solvated polymer precipitates. Values obtained with toluene as precipitant are larger and the decrease is less marked. A differently solvated polymer may be precipitated. δ_2 values for ethyl cellulose decrease slightly on ascent of each series but the values obtained with the non-polar solvents are larger and effectively constant. Values for cellulose acetate with hexane and toluene as precipitants are similar and, apart from the doubtful case of nitro-

Solvent	CELLULOSE NITRATE Hexane	CELLULOSE NITRATE Toluene	CELLULOSE ACETATE Hexane	CELLULOSE ACETATE Toluene	CELLULOSE ACETATE Ethanol	ETHYL CELLULOSE Hexane
acetone	10.25	10.5	11.24	11.10	9.52	9.46
methyl ethyl ketone	9.72	10.41				9.35
methyl n-propyl ketone	9.44	10.34				9.30
methyl n-amyl ketone	9.13	10.24				9.20
methyl n-hexyl ketone	9.06	10.11				
methyl acetate	10.14	10.56	11.07	11.10	9.37	9.43
ethyl acetate	9.56	10.42				9.32
n-propyl acetate	9.31	10.31				9.21
n-butyl acetate	9.19	10.23				9.13
n-amyl acetate	9.12	10.19				9.16
chloroform						9.11
carbon tetrachloride						10.08
benzene						10.06
toluene						9.96
pyridine			10.98	11.03	10.01	
α-picoline			10.68	10.82	9.30	
β-picoline			10.96	11.05	9.94	
γ-picoline			10.77	10.91	9.80	
nitromethane			—	9.68	10.89	
aniline			—	11.43	10.46	
dioxan			11.10	11.10	9.80	

Table 4. Values of δ_2

methane, do not vary much with solvent. Values obtained with ethanol are smaller and more variable. Although the doubt attached to the δ_m values obtained with ethanol makes the corresponding values of δ_2 doubtful, it is possible that a polymer partially or wholly solvated by ethanol may precipitate. Ethanol is known to be capable of solvating both hydroxyl and acetyl groups.[3,9]

Although the rather large assumptions made in the estimation of the values of δ_2 make them only suitable for qualitative comparison they help, in certain cases, in interpreting the variation of volume of precipitant with solvent. Comparison of the δ_2 values for ethyl cellulose with the δ_1 values for the solvents shows that in the cases of acetone, methyl acetate and chloroform $\delta_1 > \delta_2$. Addition of hexane to these solvents should initially result in an increase of solvent power which reach an optimum and then decrease on further addition. In other cases $\delta_1 < \delta_2$ and addition of hexane should decrease solvent power. The χ values in Table 5, obtained from osmotic pressure measurements on dilute solutions of ethyl cellulose in solvent/hexane mixtures, show the predictions to be true.

In the cases of cellulose acetate with hexane and toluene as precipitatnts all the δ_2 values, with the exception of that obtained with nitromethane, are greater than the corresponding values of δ_1. Addition of either precipitant should cause solvent power to decrease and this has also been verified. The volume of precipitant tends to be smaller as the difference between δ_2 and δ_1 increases. If the entropy and heat evolution contributions to χ do not vary much with solvent the observed variation of volume of precipitant with χ follows. Because of the doubt attached to the δ_2 values obtained with ethanol as precipitant simple interpretation of the variation of volume of ethanol with solvent does not seem to be possible.

The variations of the volumes of precipitants with solvent are also difficult to interpret in the case of cellulose nitrate. Values of χ suggest that butyl acetate and methyl amyl ketone are the best solvents and these require the largest volumes of hexane in each solvent series. If χ_s and the contribution to χ which results from heat evolution do not vary much the best solvent should be that whose solubility parameter is

Solvent (proportions by volume	χ
acetone	0.45
acetone/hexane 2:1	0.42
acetone/hexane 1:1	0.41
acetone/hexane 1:2	0.45
methyl n-propyl ketone	0.37
methyl n-propyl ketone/hexane 5:1	0.43
methyl n-propyl ketone/hexane 5:3	0.44
methyl n-propyl ketone/hexane 1:1	0.47
methyl acetate	0.41
methyl acetate/hexane 2:1	0.34
methyl acetate/hexane 1:1	0.35
n-butyl acetate	0.24
n-butyl acetate/hexane 5:1	0.33
n-butyl acetate/hexane 5:4	0.36
chloroform	0.34
chloroform/hexane 2:1	0.31
chloroform/hexane 1:2	0.36

Table 5. χ values for ethyl cellulose/solvent/hexane/systems.

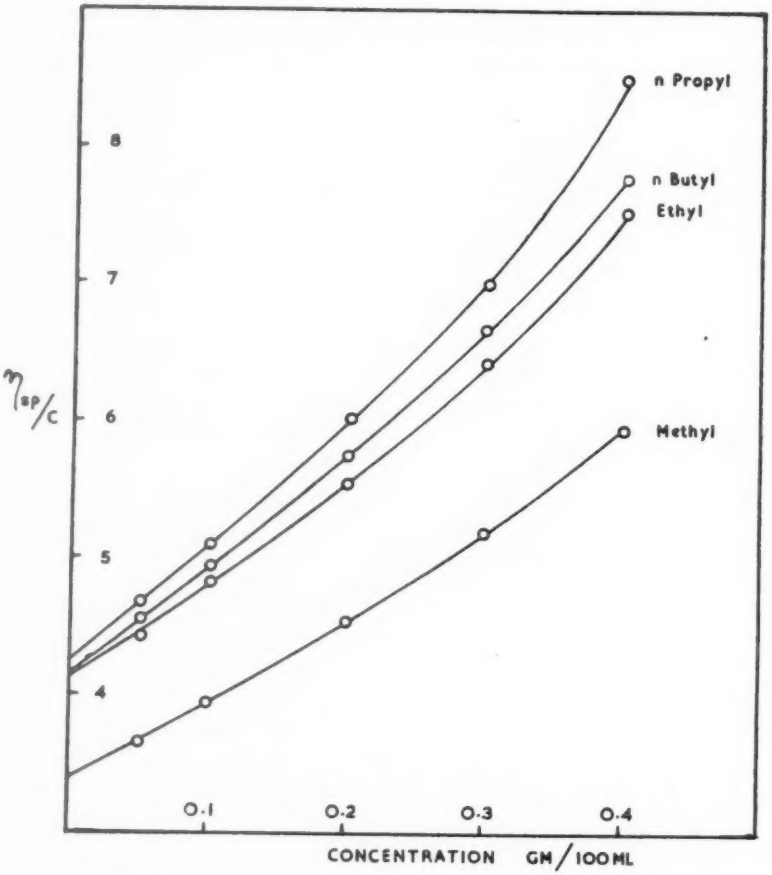

Figure 6. Viscosity number against concentration plots. Cellulose nitrate in alkyl acetates. (25°C).

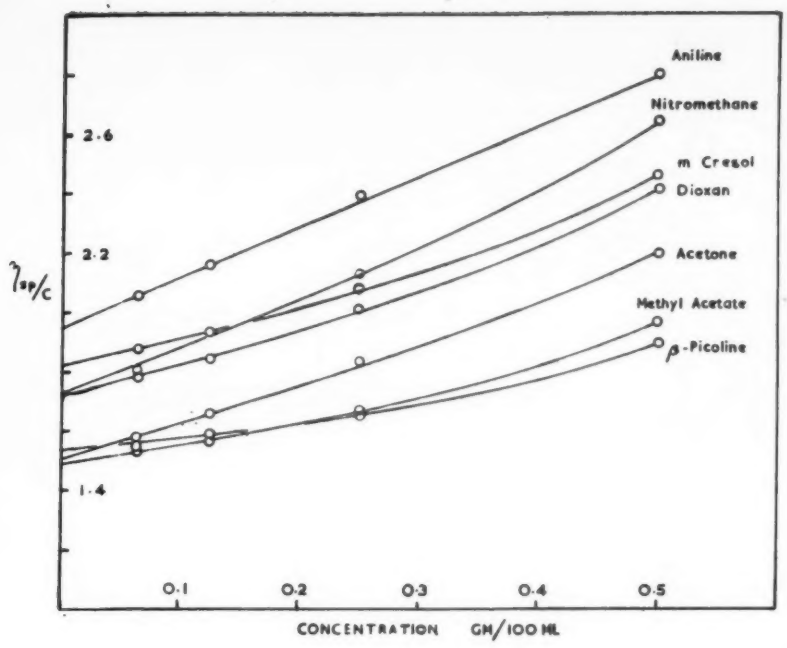

Figure 7. Viscosity number against concentration plots. Secondary cellulose acetate in representative solvents (25°C).

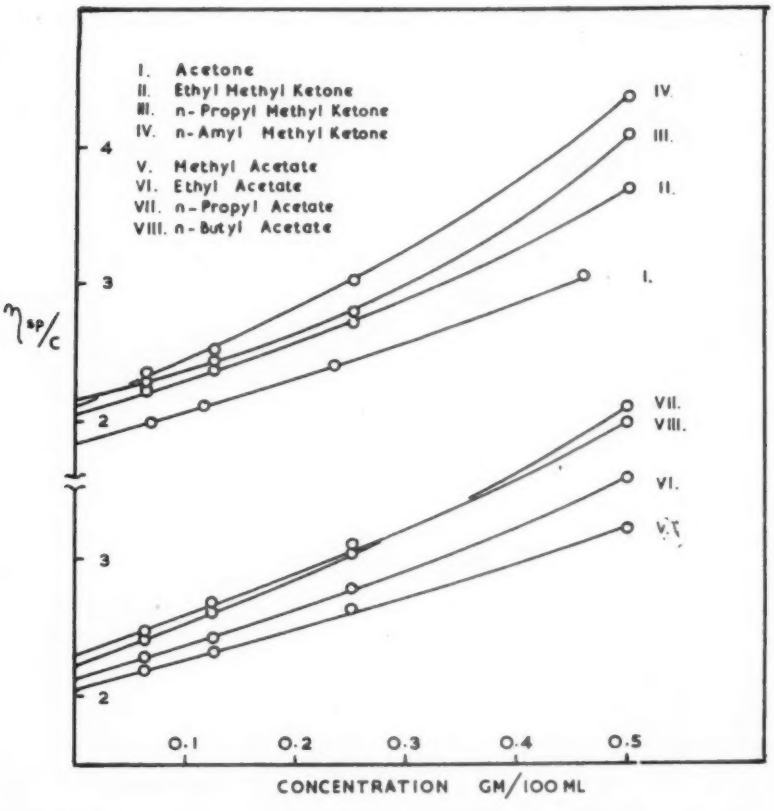

Figure 8. Viscosity number against concentration plots. Ethyl cellulose in methyl ketones and alkyl acetates (25°C).

closest to that of the solvated polymer. The differences between δ_1 and δ_2 do not suggest that these two solvents are the best. This may be a consequence of assumptions made in the interpretation of the values of χ and in the estimation of δ_2. It is possible that some desolvation of less firmly bound solvent occurs on addition of hexane. With toluene as precipitant the δ_2 values are larger and less variable than with hexane. δ_1 is always less than δ_2 and the differences increase on ascent of each series of solvents. In view of the possibility of toluene taking part in solvation it is unlikely that there will be any simple relationship between the volume of toluene required for precipitation and χ values obtained from osmotic studies on solutions in pure solvents.

These tentative interpretations of the precipitation results seem, however, to account fairly well for those obtained with ethyl cellulose and cellulose acetate. They may provide an alternative and complementary view to the mechanistic theory of Doolittle,[17] who found that the molar concentration of solvent at the precipitation point approaches a minimum as a homologous series of solvents is ascended. This would seem to correspond to the limiting value of δ_m observed on ascent of each series.

There would seem to be at least two requirements if solvents are to be placed in order of thermodynamic solvent power by the precipitation method. The precipitant should not specifically interact with the polymer, as is possible in the cases of toluene with cellulose nitrate and ethanol with cellulose acetate. Also, as Gee[23] has pointed out, the solvents to be compared, and the precipitant, should all have solubility parameters on the same side of that of the polymer.

Viscosity Studies

The variation of the viscosities of dilute solutions with concentration of polymer c is illustrated in Figures 6-9 by typical plots of viscosity number, η_{sp}/c, against c. η_{sp} equals $(\eta - \eta_o)/\eta_o$, where η is the viscosity of the solution and η_o that of the solvent. Most of the plots show upward curvature at concentrations above ca. 0.2

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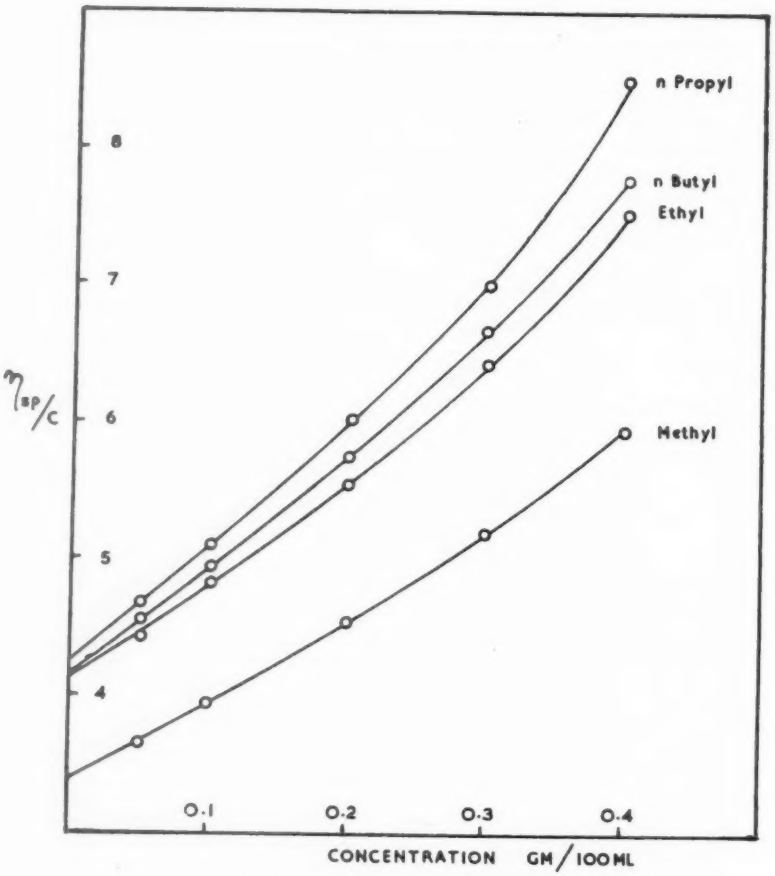

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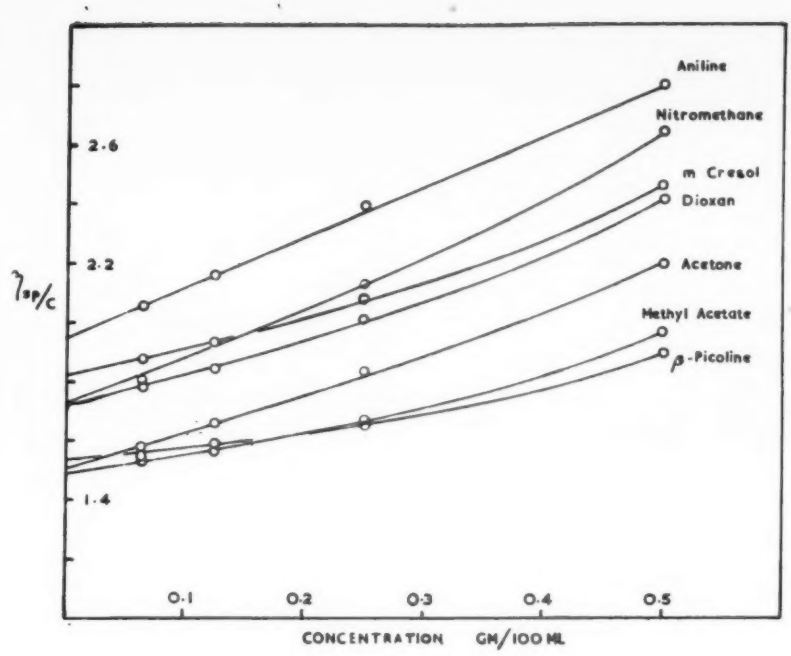

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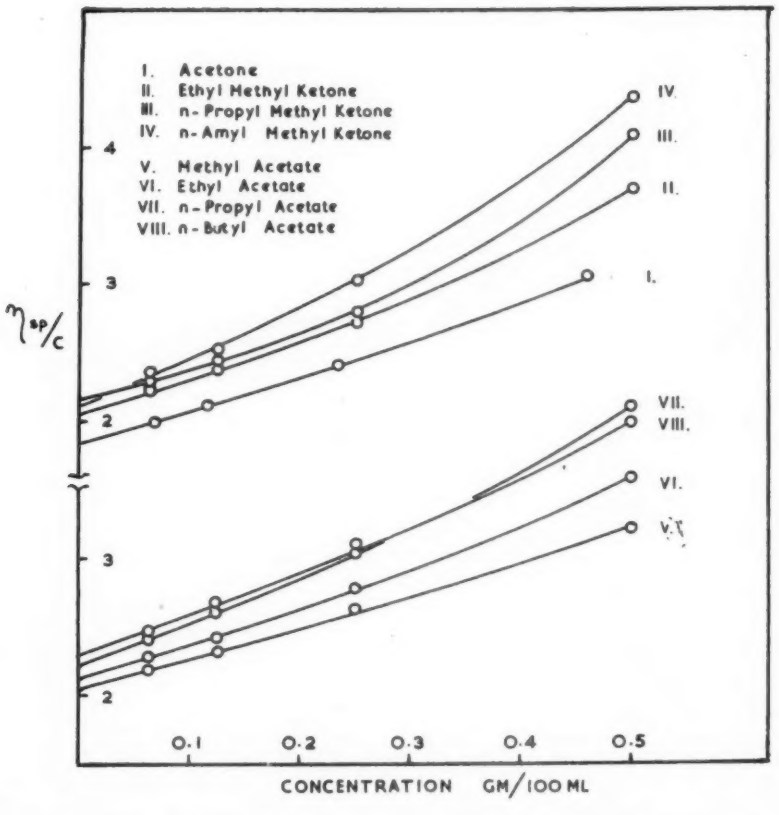

Figure 8. Viscosity number against concentration plots. Ethyl cellulose in methyl ketones and alkyl acetates (25°C).

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Solvent	CELLULOSE NITRATE [η]	k′	Initial slope	k_s	χ	ETHYL CELLULOSE [η]	k′	Initial slope	k_s	χ
acetone	2.79	0.49	3.8	0.42	0.27	1.86	0.68	2.3	0.57	0.46
methyl ethyl ketone	3.29	0.40	4.3	0.38	0.21	2.00	0.59	2.5	0.58	0.42
methyl n-propyl ketone	3.56	0.44	5.6	0.41	0.15	2.16	0.54	2.5	0.45	0.37
methyl n-amyl ketone	3.82	0.41	5.8	0.42	0.02	2.14	0.59	2.7	0.63	0.38
methyl n-hexyl ketone	3.49	0.30	3.7	0.34	0.16					
methyl acetate	3.33	0.54	5.9	0.43	0.30	2.03	0.51	2.0	0.49	0.41
ethyl acetate	4.11	0.35	5.9	0.36	0.22	2.10	0.58	2.1	0.49	0.40
n-propyl acetate	4.23	0.38	6.7	0.41	0.13	2.21	0.53	3.3	0.55	0.33
n-butyl acetate	4.20	0.43	7.2	0.38	0.015	2.28	0.62	2.3	0.48	0.24
n-amyl acetate	4.21	0.35	6.2	0.40	0.02	2.26	0.50	2.25	0.49	0.28
chloroform						2.30	0.70	3.7	0.68	0.34
carbon tetrachloride						2.50	0.68	4.3	0.60	0.46
benzene						2.20	1.06	5.0	0.87	0.48
toluene						2.23	0.94	4.6	0.96	0.47

CELLULOSE ACETATE

Solvent	[η]	k′	Initial slope	k_s	χ
acetone	1.49	0.61	1.35	0.53	0.45
methyl acetate	1.48	0.28	0.60	0.42	0.46
pyridine	1.46	0.22	0.45	0.33	0.28
α-picoline	1.37	0.54	1.05	0.44	0.36
β-picoline	1.55	0.05	0.10	0.30	0.285
γ-picoline	1.30	0.81	1.35	0.48	0.26
nitromethane	1.73	0.48	1.45	0.51	0.44
aniline	1.96	0.45	1.75	0.37	0.38
dioxan	1.70	0.39	1.15	0.42	0.38

Table 6. Viscosity parameters.

g./100 ml. Such curvature, which is not observed with flexible polymers at such concentrations, results from hydrodynamic interaction between extended chains and increases with both molecular weight of polymer and solvent power of solvent.

A number of parameters, derived from viscosity measurements, have been suggested as measures of solvent power. With flexible polymers, the variation of η_{sp}/c with c is given by

$$\eta_{sp}/c = [\eta] + k'[\eta]^2c$$

where $[\eta]$, called the limiting viscosity number or intrinsic viscosity, is the value of η_{sp}/c as c tends to zero. In the case of flexible polymers, $[\eta]$ increases and k' decreases with increasing solvent power. The initial slopes of viscosity number against concentration plots have been suggested as measures of solvent power for polar polymers.[24] For such polymers Spurlin[13] has suggested that k_s, the ratio of the slope of a plot of $\log(\eta_{sp}/c)$ against c to the limiting viscosity number, decreases with increasing solvent power. Values of these different parameters, with values of χ, are given in Table 6.

(Turn to page 94)

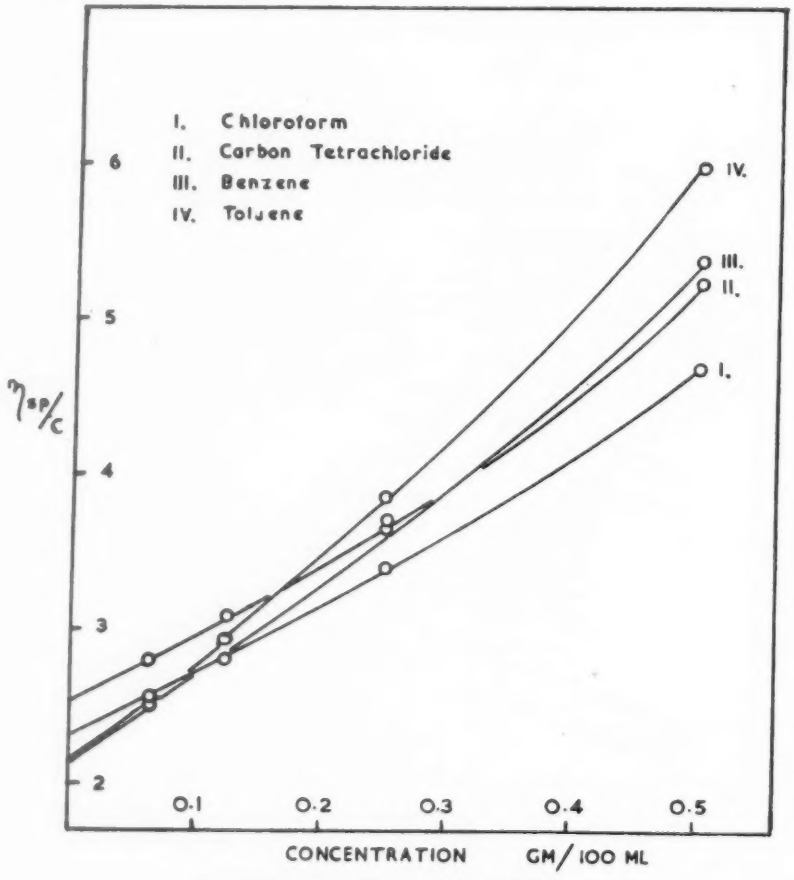


Figure 9. Viscosity number against concentration plots. Ethyl cellulose in chloroform, carbon tetrachloride, benzene and toluene (25°C).

The author continues his random reflections on various aspects of the paint industry. The opinions expressed in this column are his alone and do not necessarily reflect those of this publication.

Teachers, Scholars and Science

SO much has already been said about the shortage of scientific personnel that perhaps nothing remains unsaid. Still, I'd like to have my innings.

The accusing finger has been pointed variously at inferior high school instruction, mentally lazy youth who prefer snap courses to "tough" science subjects, interruptions due to military careers, poor salary prospects, poor public relations, etc.

Undoubtedly it's a combination of all of these plus one other pertinent and often overlooked factor. Inferior and disinterested teaching at the undergraduate college and university level.

Yes, I know the colleges like to blame the high schools. But few college students have not had the deadening experience of sitting in a huge crowded lecture room and listening to a famous professor reading his lecture in a monotonous droning voice more conducive to sleep than inspiring to great accomplishment. "Is this the exciting horizon of science in the 20th Century?" the student asks himself. Then he goes to his laboratory period which is conducted by a fledgling instructor with no knowledge of pedagogy.

The reason for this setup is not mysterious. Usually the professor

Phil Heiberger

is absorbed in his own research and is rather bored with repetition of the more elementary aspects of his field. The laboratory instructor, on the other hand, is concerned with his own studies and is simply teaching as a means to make ends meet until such time as he can get his degree and nab the job he really wants.

Of course there are always exceptions, but take your own personal inventory. How many inspired and dedicated teachers can you name? How many have you had altogether?

Perhaps we should reconsider the function of our universities and colleges. Are they primarily research stations with an educational sideline, or are they primarily teaching institutions supporting research as an adjunct to their teaching?

Time and again you see statistics pointing up the pitifully small number of beginning science majors. It would appear that there's nothing the science professors can do if students by-pass them by signing up for majors in law, home economics, or business.

Actually the situation is not as clear cut as that. There are many avenues of approach—some less obvious than others.

As I see it, there are three basic fertile recruitment sources, two of which are often sadly neglected. 1. Pre-college students. 2. Non-science majors. 3. Science majors. Let's examine the possibilities in each group.

As a rule, pre-college students have not yet chosen a career. Public relations, good high school teaching, and the routine recruitment techniques can do much to attract members of this group.

In most schools non-science majors are faced with a one-year science requirement for the bachelors degree. So-called "terminal" courses are planned for these students. That is, it's understood from the beginning that this year's course will be the only science course the

student will take and he takes it under duress.

Naturally, professors are not fond of teaching terminal courses. They know full well that they have captive students who would prefer to be elsewhere. Professor and students often stoically suffer through their ordeal with the grim attitude, "It's miserable, but necessary, so let's get it over with." It's a painful experience for both.

Such a defeatist attitude is a big mistake and a real handicap. An enthusiastic, interesting teacher with an imagination and a sense of humor approaches his task differently. He regards this as a golden opportunity to win potential scientists from their original career choices, often made for trivial reasons. And he sometimes succeeds. "When life hands you a lemon," a homespun philosopher once said, "squeeze it and make lemonade."

Impossible? Certainly not. Thumb through a brief history of chemistry, some day, just for fun, and you'll be surprised to find many outstanding scientists who started on the road to other careers. Why, August Wilhelm Hoffman began his university studies with the intention of becoming a lawyer, and Friedrich August Kekule originally headed in the direction of architecture. Both of these men, fortunately for them and for us, came under the influence of Liebig, and decided to devote themselves to chemistry with brilliant results. From this point of view, the professor of terminal science courses is in a key spot, more important than he himself may realize.

The third category mentioned above was science majors. This may puzzle you. It shouldn't, because the converse of what I just said about winning non-science students to science, is also true. In other words, an uninspiring teacher not only fails to stimulate his students to produce to the peak of their ability, his ineptness can actually cause students to turn their backs on science and look elsewhere for more palatable study fare. Too often beginning science students switch majors to non-science subjects, netting science a real loss.

There's no getting around it. The power of the undergraduate science teacher is great and the fate of his students hinges on his personality, ability, enthusiasm, and whole-hearted effort.

Rising Tempo of Research

IF you are waging an uphill fight to keep on top of the ever increasing flood of scientific publications, you may find some consolation in the following conclusive proof that you are not alone.

In recognition of this universal problem, the *National Science Foundation*, the *National Academy of Sciences*, and the *American Documentation Institution* have organized an international conference to be held in Washington, D.C. in November 1958, with the aim of improving dissemination of reports and publications resulting from the "rising tempo of research activity."

Even in the young field of civilian atomic energy, growth is rapid and, as *Dr. Walter G. Whitman*, who was secretary-general of the *United Nations 1955 "Atoms for Peace" Conference in Geneva*, stated, "A basic problem is how to expedite dissemination of information on new developments."

So in March 1957, the big attraction will be the 1957 Nuclear Congress in Philadelphia's Convention Hall. Dr. Whitman, who is president of the American Institute of Chemical Engineers, has been named general chairman of Congress, in Dr. Whitman's words, is "to promote the use of atomic energy for peaceful purposes in all nations of the world." The slogan: Atoms for Progress.

More and More About Less and Less

A WORKMAN is no better than his tools and a chemist is rarely better than his instruments. Since mankind is perfect, the problem, then, is to improve the instruments at our disposal.

For some time now, I have been musing over the manifold possibilities of the relatively new extension of chromatography known as vapor chromatography. The scope of this technique has received wide publicity and the general background is fairly well known. And certainly it has not escaped the attention of laboratories serving the coatings industries. We have good reason to hope, therefore, that frustrating problems involving the identification and separation of minute amounts of nearly similar volatile compounds may soon be elucidated, i.e., oxidation products of drying films, deterioration products of decomposing films, and so on.

In a paper "Gas Chromatograghic Determination of Some Hydrocarbons in Cigarette Smoke," [Anal. Chem. *28*, 1685 (1956)], H. W. Patton and G. P. Touey found it possible, by using a column containing silica gel and employing helium as a carrier, to determine seven hydrocarbons in a 10 ml. sample of cigarette smoke. These are ethane, ethylene, acetylene, propane, propylene, isobutane, and butane.

Ethane, ethylene, propane, and propylene were present in amounts sufficient to enable determination of changes in their concentrations accompanying variations in the smoking procedure. For example, the concentrations of these compounds increased as the length of the cigarette butt decreased.

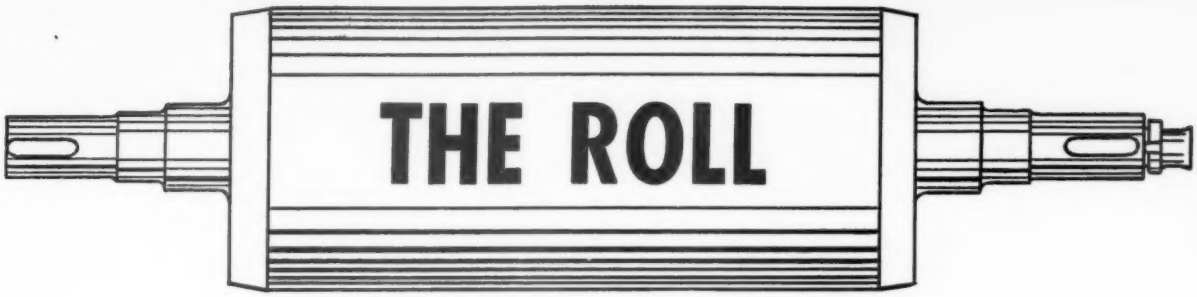
This information may change your smoking habits, and similar information slanted toward paints, may some day change your formulating habits.

New Skins For Old

TINY hollow plastic spheres have been used in a number of industries as floats on tanked fluid surfaces. By virtue of extensive interlocking and clustering at the surface of volatile solutions, they function admirably to retard evaporation rates of plating solutions, petroleum fractions, brines, and industrial reservoirs.

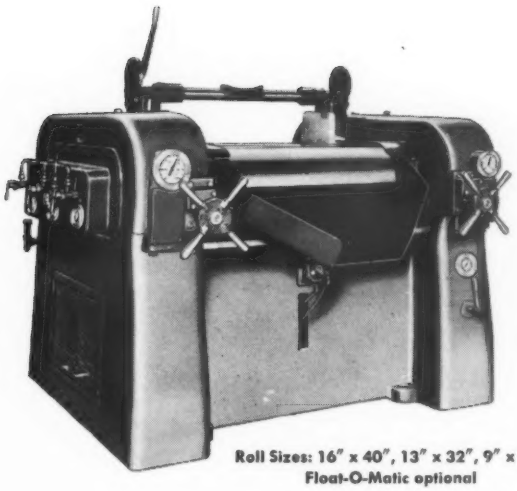
They haven't been too widely used in paint and lacquer manufacturing plants, of course, because the types of floats available to us heretofore—pyroxylin ping pong balls, expanded phenolic spheres, waxed pellets, and so on—were manifestly unsuitable.

Now, however, with the introduction of expanded polyethylene floats, perhaps we too may be able to make good use of the float principle. The outstanding chemical and solvent resistance of polyethylene and the resistance of the floats to puncture and breakage should make these new-style floats a natural for paint and lacquer plants.

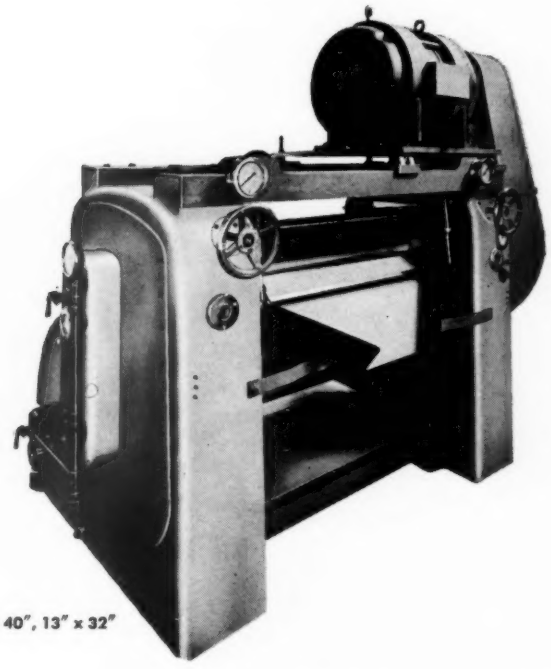


IS THE

HEART OF EVERY MILL



Roll Sizes: 16″ x 40″, 13″ x 32″, 9″ x 24″
Float-O-Matic optional



Roll Sizes: 16″ x 40″, 13″ x 32″

Among the many excellent engineering features that distinguish Lehmann Roller Mills, none is more important than the roll itself. Heat transfer, so vitally important to uniform dispersion (roll coverage), has attained an outstanding degree of efficiency in Lehmann Rolls. This is due to design, material, precision machining, and end head construction.

Centrifugal casting provides an extremely tight, dense grain structure with greater uniformity of hardness at the grinding surface. This chilled white iron roll surface is inseparably bonded to a high quality gray iron core, for maximum strength and resilience. The surface of the roll is bevelled at both ends for side shields.

Unique end head construction insures longer roll life, high power transmission and shock resistance.

Sight-O-Matic* provides three-fold gauge control over: dispersion, take off efficiency, product temperature.

The cost-saving features of Lehmann Mills afford the manufacturer new opportunities, in these days of increasing competition. Let us show you what a modern Lehmann Mill can do for you.

*Reg. U. S. Pat. Off.

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Manufacturers of quality papers specify Du Pont TI-PURE® *titanium dioxide pigment to add brightness and opacity . . . just as makers of quality printing inks specify Du Pont Pigment Colors for fine reproduction. Reprints of this illustration, suitable for framing, are available on request from your Du Pont Pigments salesman.*

Du Pont Pigments add beauty...practicality...versatility

NATURE'S COLORS ARE RIVALED BY DU PONT PIGMENTS

The brilliance of a butterfly captured in durable, lightfast colors for your paints

IN PAINTS as in nature, color appeal is important. But you also require durability and lightfastness for your paints. Du Pont offers a wide range of versatile, lightfast pigment colors designed to keep your paints looking better—longer.

Does your line include oil-base house paints for exterior use? If so, you have a choice of pigments especially suited for the manufacture of these paints. Du Pont Green-Gold YT-562-D, for example, has outstanding color retention and is highly resistant to chemical fade.

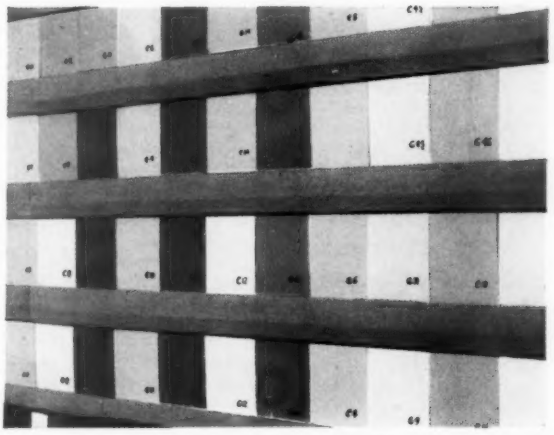
"Ramapo" Green GP-755-D, "Ramapo" Blue FR BP-366-D and Medium Chrome Yellow Y-469-D also show outstanding performance under severe outdoor conditions. Parachlor Red RT-427-D is ideal for producing the bright solid reds for your house-paint line.

Your Du Pont Pigments representative is ready to help. Remember... as a leading manufacturer of pigments for paints, Du Pont has a background of experience unmatched in the field. E. I. du Pont de Nemours & Co. (Inc.), Pigments Department, Wilmington, Delaware.

• • •

These high-quality Du Pont Pigments are illustrative of many in the Du Pont line which will give you the colors and properties you require.

Green-Gold—
Durable Organic Yellow
Monastral® Blues and Greens
"Ramapo" Blues and Greens
Molybdate Oranges
Chrome Yellows
Parachlor Red
Shading Yellow
Zinc Yellow
Toluidine Reds
Ti-Pure® Titanium Dioxide



At the Du Pont Pigments Test Farms, histories on many paints (including stucco, cement and shingle paints) are being compiled on the paint formulations you will be making tomorrow.

Data from the test fences are supported by tests conducted on houses in many sections of the country. The paint used on this house contained Du Pont Green-Gold YT-562-D and exhibited excellent resistance to fade.

PIGMENTS DEPARTMENT

DU PONT

REG. U. S. PAT. OFF.

to fine products everywhere

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

The proof is piling up!

Isophthalic Based House Paints are Vastly Superior

Exterior house paints based on Isophthalic—

***have** uniform through-dry—no paint wrinkling*
Oronite's extensive testing, plus results by leading resin manufacturers, prove Isophthalic greatly superior to other materials in this regard.

***have** faster drying properties*
The higher, more uniform molecular weights give a dry film — quicker.

***have** practically no yellowing in light tints*
With Isophthalic, oils can be used which greatly reduce the amount of normal paint yellowing.

***have** mildew resistance*
This quality appears to result from less unattached fatty acids present.

***have** outstanding flexibility characteristics*
At longer oil lengths greater flexibility results from higher proportion of flexible fatty acids in the molecule.

***have** better color retention*
Closer bonding of pigment particles give more uniform color appearance after application.

***can be** manufactured at lower cost*
Manufacturing costs can be reduced because more low-cost oils can be used.

Resin and paint manufacturers can now offer new and improved products with Oronite's new, advanced raw material — Isophthalic. Contact any Oronite office for complete information—or ask your resin or paint manufacturer about Isophthalic.

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Mercantile Securities Bldg., Dallas 1, Texas 450 Mission Street, San Francisco 5, Calif.
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36, Avenue William-Favre, Geneva, Switzerland
4021

NEWS

"Adhesion" Is Discussed By New York Paint Club

The subject of "Adhesion" was the featured topic when the New York Paint and Varnish Production Club convened on February 7. Speakers were Dr. Herman F. Mark of the Polytechnic Institute of Brooklyn and Robert J. Phair of the Bell Telephone Laboratories, Murray Hill, N. J.

H. F. Mark

R. L. Phair

Dr. Mark is Director of the Polymer Research Institute at the Polytechnic and a polymer scientist of international renown. Included in his discussion were some theoretical aspects of adhesion, touching on adhesion phenomena in block and graft polymers.

Mr. Phair is on the technical staff of the Chemical Research Department of the Bell Labs and is chairman of Group 10 on "Adhesion" for the American Society For Testing Materials. He discussed techniques and problems encountered in the measurement of adhesion properties of organic coatings.

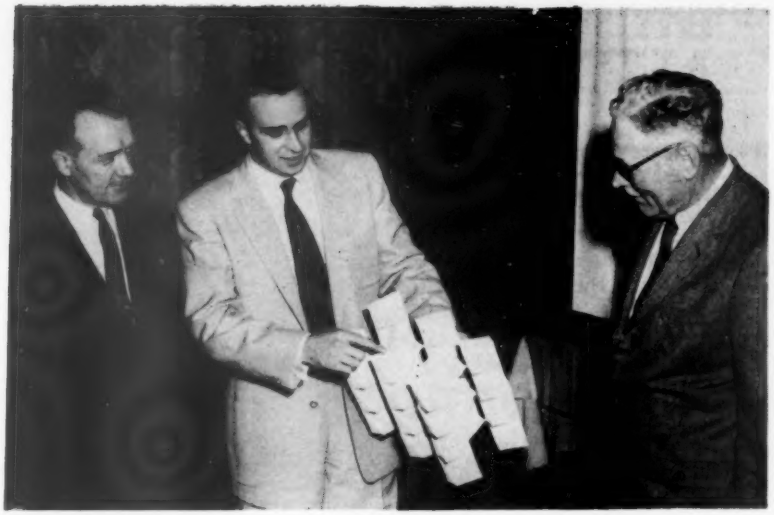
•

Fischer & Porter Expands

Fischer & Porter Co. has just purchased two land tracts in central Bucks County, Pennsylvania. Both tracts, eight miles from the present Hatboro location, are tied in with plans for company expansion.

The larger of the two areas will accommodate buildings for offices, research laboratories and additional production facilities. The proposed buildings will occupy a third of the 120 acre tract.

A nearby 65 acre tract will be developed as a recreational facility for Fischer & Porter personnel.



PAINT MEETING: At a recent meeting, the Philadelphia Paint and Varnish Production Club heard a discussion on "Industrial Finish Application of Titanium Dioxide," by Dr. William S. Castor, Jr., American Cyanamid Co. Dr. Castor, (shown holding a model crystal structure of rutile titanium dioxide), supplemented his talk with slide projections, and he was assisted by Lewis A. Melsheimer (right), Director of Technical Service, Pigment Division, American Cyanamid. James Sandeman, Vice President and Program Chairman of the Philadelphia Paint and Varnish Production Club is pictured at the left.

Forecast Increased Use Of "Flushed" Pigments

Widespread use by the paint manufacturing industry of "flushed" pigments to make household and industrial paints was forecast last month at a meeting of the Piedmont Section of the Southern Paint and Varnish Production Club.

Joseph A. Langner, The Hilton-Davis Chemical Co., Cincinnati, referred to flushed colors as "one of the most significant advances in paint-making." In addition to manufacturing economies, the technique provides pigments with a "strength, gloss and sharpness never before attained," he said.

Principal advantage of the flushing method, Mr. Langner explained, is its ability to carry an individual pigment particle, surrounded by water, from its original finely divided state into the vehicle or oil phase, without destroying its minute, uniform size. No grinding of pigments is needed as in the case of dry colors, which have been used for decades in making paints.

The flushing process was pioneered by Hilton-Davis, first in the printing ink industry and later in the textile, paint and plastic fields. Its widest application in paints today is in automobiles where high gloss is important, the meeting was told.

Neville Chemical Plans Larger Research Base

Neville Chemical Co., a leading producer of resins and other coal and petroleum by-products, has announced it will spend $750,000 to double its Pittsburgh research facilities.

President Lee V. Dauler said a new $600,000 completely air-conditioned building will go up on his company's 50-acre Neville Island tract and another $150,000 will be spent on new laboratory and office equipment. He said the expansion will mean a 50 per cent increase in Neville Chemical's research staff.

Mellon-Stuart Co., Pittsburgh contracting engineering firm, already has started construction on the new two-story brick building which will contain 31,000 square feet of floor space. The building is scheduled for completion late this coming summer and will be located near the company's main plant.

•

Diamonite Opens on Coast

To provide better service to the trade west of the Rocky Mountains, Diamonite Products Manufacturing Co., Canton, Ohio, has opened western regional offices in Downey, Calif.

Complete technical and sales service on Diamonite's cutting tools and grinding media will be offered at the new office.

NEWS

Industry Helps Teach University Paint Course

John Platner, sales service representative of the Goodyear Tire and Rubber Company's Chemical Division, was one of a number of industrial representatives who participated in a short course in paint technology at the University of Florida during the last week of January. Mr. Platner discussed exterior masonry paints.

John Platner

The week-long session was designed to include talks and discussions by a number of representatives having experience in the paint industry. Purpose of the course was to provide fundamental information concerning paint and related industries to those desiring to broaden their knowledge of the coatings field.

The special short course was sponsored jointly by University of Florida and Southern Paint and Varnish Production Club. Director of the course was Henry F. Payne, professor in charge of organic research and technology at the University of Florida.

•

Glidden Get-Together

Top laboratory and production personnel of The Glidden Company's Paint and Varnish Division gathered in Cleveland during late December to discuss research, development, laboratory operations and new products.

Keynote of the conference, the ninth annual combined technical and superintendents meeting, was "Mutual Responsibility for Future Growth and Profit."

More than 160 Glidden technicians from the United States, Canada and several points overseas attended the five-day conference. Purpose was to coordinate Glidden's far-flung laboratory and production programs.

RETIREMENT TESTIMONIAL: George T. Sohl retired on December 31 after more than 27 years as the Cleveland area representative of Rohm & Haas Co. and of its former associate firm, The Resinous Products & Chemical Co. William Gibson, a co-worker in the Cleveland office, acted as toastmaster at a testimonial luncheon given for Mr. Sohl by the company on November 7. He is shown (left) presenting Mr. Sohl with letters from friends unable to attend.

Film on Traffic Paints

A new film on the selection and application of traffic paints has been made available by Hercules Powder Co., Wilmington, Del. The 16-mm. film, "Highway Life Line", is in sound and color and runs for about 16 minutes.

Against a backdrop of colorful highway scenes from coast to coast, the film covers subjects such as methods of evaluating traffic paints; factors influencing paint performance; and various methods of applying traffic paints.

Prints of the film may be obtained from the Advertising Department, Hercules Powder Co., Wilmington 99, Del.

•

Louisville Paint Club

The Louisville Club of the Federation of Paint & Varnish Production Clubs will hold its spring seminar March 3-4 on "Mildewcides and Fungicides." The meeting is scheduled at the Sheraton-Seelbach Hotel, Louisville.

Registration will be 4 to 6 pm Sunday the 3rd, and 8 to 9 am on Monday. The six technical papers will be presented Monday morning and afternoon, with a forum discussion and questions following supper.

All interested in attending the paint club meeting may write for reservations c/o W. B. Tabler Co., Louisville, Ky.

Celanese Mexicana Builds

Celanese Mexicana, S.A., an affiliate of Celanese Corporation of America, has started construction of a new chemical plant near Mexico City for the manufacture of formaldehyde and the formulation of synthetic resins derived from that intermediate raw material.

The new plant, located 12 miles north of Mexico City at San Cristobal Ecatepec, will supply Mexico's growing needs for components used in the manufacture of plastics. Production of formaldehyde will mark the entry of Celanese Mexicana into the chemical producing field, further expanding its already diversified operations.

•

Scally Names Agent

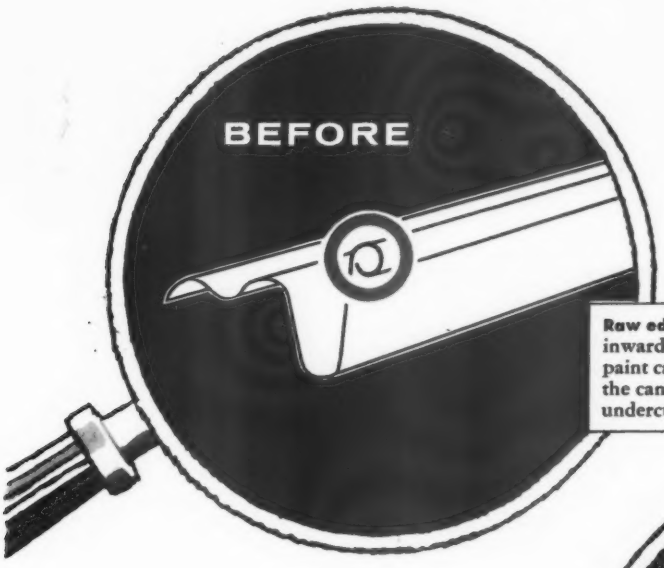
Scally Waterproofing Co., St. Louis, Mo., is expanding its activities to include sales and application service on the full line of "Liquid Envelope" vinyl protective coatings produced by Better Finishes and Coatings, Newark, N. J. These coatings are designed for use in both sidewall roofing and interior surfaces.

Edward Powers of Scally Waterproofing has completed an intensive course at the Product Application Laboratory of Better Finishes and will be available as a technical and sales representative on "Liquid Envelope" Architectural Coatings in the St. Louis area.

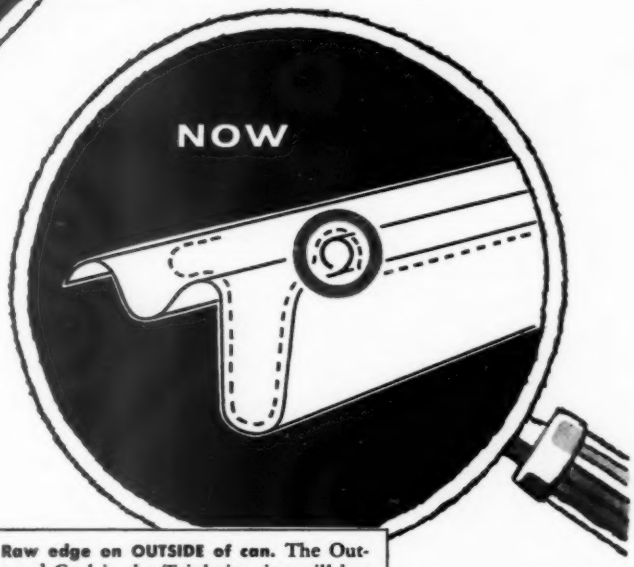
Now...give your polyvinyl acetate and latex base paints

6 to 9 months longer shelf life

with Continental's Outward Curl can



Raw edge on INSIDE of can. Made with an inward curl, former multiple friction ring paint cans left an edge of raw metal inside the can. If corrosion started here, it might undercut interior enamel and result in rust.



Raw edge on OUTSIDE of can. The Outward Curl in the Tripletite ring still has an edge of raw metal. But this raw edge is now outside the can. There is no chance of exposed steel touching your polyvinyl acetate or latex base paints.

Yes, your polyvinyl acetate and latex base paints get 6 to 9 months longer shelf life—6 to 9 months longer *sales* life—with Continental's Outward Curl paint can.

Because the Tripletite friction ring is curled outside the can, every square inch of inside surface is enameled. Raw metal simply can't touch your paint. In addition, you get the protection of Continental's exclusive Tripletite lid—with 50% increase in guard points against oxidation and messy paint skin.

Continental's Outward Curl can is now increasing shelf life for paint manufacturers across the country. Why not let it work for you? As a Continental customer, you'll find our tailor-made engineering and research services are as up-to-date as our containers.

CONTINENTAL CAN COMPANY

Eastern Division: 100 E. 42nd St., New York 17
Central Division: 135 So. La Salle St., Chicago 3
Pacific Division: Russ Building, San Francisco 4

NEWS

A. A. Schlesinger

Simon Askin

Heyden, Newport Merge; Join Assets and Business

Heyden Chemical Corp. and Newport Industries, Inc. have combined their assets and business. Heyden has acquired the assets of Newport and changed its name to Heyden Newport Chemical Corp.

Simon Askin is president and chief executive officer of Heyden Newport Chemical Corp. Armin A. Schlesinger has been elected chairman of the board and John P. Remensnyder, vice-chairman.

The Heyden board has been enlarged to include seven members designated by Newport in addition to the nine Heyden directors. The business of Newport will be continued under its present operating management as Newport Industries Co., a division of Heyden Newport.

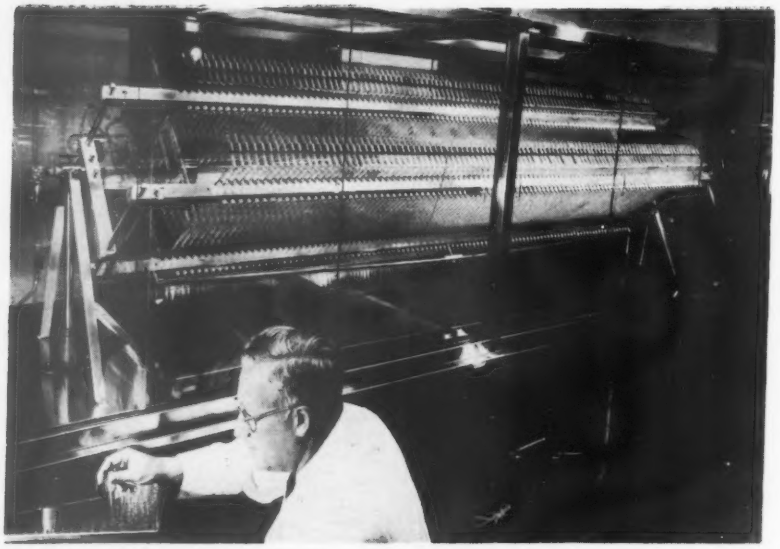
E. F. Sisson will be president and S. J. Spitz, executive vice president of the division. Both Mr. Sisson and Mr. Spitz have also been elected vice presidents of Heyden Newport.

•

National Packaging Show Reports Early Interest

More than one-third of the exhibit space in The National Industrial Packaging and Handling Exposition of 1957 has already been reserved, according to John W. McReynolds, president of the Society of Industrial Packaging and Materials Handling Engineers and director, Materials Handling Engineering, for Kraft Foods Co.

The Exposition will be held in Atlantic City Convention Hall, October 28 through 31. Over 50,000 square feet of exhibit space has been set aside for the national exposition.



Dr. Herbert J. Dutton with the pipe-organ-like instrument he used to determine the complex glyceride structure of vegetable oils.

Dr. Herbert Dutton Wins Top GPA Research Award

Dr. Herbert J. Dutton, United States Department of Agriculture research chemist, has won first award of $1,000 and an honor plaque in the 1956 Glycerine Research Awards, it was announced last month by the Glycerine Producers' Association. The Association makes these awards annually in recognition of new and independent research contributing to knowledge and use of glycerine.

Dr. Dutton's award-winning accomplishment was the application of a recently developed extraction technique to investigate complex natural glycerides such as linseed oil. His work is a major breakthrough in developing new and significant data on fats and oils, which are mixed esters of fatty acids and glycerine.

Such fundamental data as Dr. Dutton obtained on the structure of natural glycerides sheds light on the mechanism by which these glycerine derivatives are synthesized in nature; points to commercial potentialities for separating chemically pure triglycerides or "tailormade" fractions from fats and oils; and enhances the utility of fats and oils as industrial chemical raw materials.

New Crown Device Tests Hardness of Coatings

A new instrument for testing the hardness of non-metallic coatings on metal, developed in the Research and Development Department of Crown Cork & Seal Company, Inc., Baltimore, will help to ascertain when a metal coating is "good" enough. The instrument, perfected by R. C. Albrecht, Crown Senior Engineer, is the subject of a pending patent application.

Already the tester is being manufactured under a licensing agreement with Crown by Gardner Laboratory, Inc., of Bethesda, Md., makers of precision scientific equipment used extensively in the paint and coatings industries. The device can test virtually all forms of coated metal, including flat stock.

Here is how the device operates: Resting on the surface of the sample being tested is a stylus, linked by electronic circuit to an electronic tube, a thyratron. In actual use, a spool-shaped weight is applied in gradually increasing degrees to the stylus. If the weight is sufficient to cause the stylus to pierce the coating and thus establish contact with the metal of the specimen surface, the thyratron tube closes a relay and a needle points to a figure on a scale. The figure represents the number of grams of weight required to break through the coating.

Crown claims the new instrument is simple to operate and in addition, is said to eliminate the possibility of the human failure factor.

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6084

The requirements for trade sales . . . lower cost, one-package systems, solvency in aliphatics, and easy hand application by brush or roller . . . are admirably met by CIBA Araldite 6084. Specify it with confidence when formulating . . .

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The versatility of Araldite 6084 esters allows their use for industrial and maintenance finishes. Addition of other Araldite Epoxy Resins will speed up or slow down reaction times, increase viscosity or reduce it to take more solids. Depending on the choice and proportion of acid used, Araldite 6084 esters can be made very pale, fast drying, extremely flexible, extremely tough.

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NEWS

Standard of Indiana Gets Aromatic Chemical Plant

A group of enterprises associated with Scientific Design Co., Inc., has developed a new hydrocarbon oxidation process to which Standard Oil Co. (Indiana) has announced acquisition of worldwide rights. Standard will manufacture phthalic anhydride, isophthalic acid, terephthalic acid, dimethyl terephthalate, dimethyl isophthalate, and benzoic acid.

Scientific Design Co., Inc., was also engaged to design Standard's plant of 60 million pound capacity for the Amoco Chemicals Corp., a Standard subsidiary which will actually be undertaking production activities. Harry A. Rehnberg, President of Scientific Design, said that it marked the first time a private engineering, research, and design group had created, wholly by itself, with its own funds, such a major technical discovery and development in the chemical field.

Checking instruments at the aromatic chemical plant built for the Standard Oil Company of Indiana.

The new process discovery furnishes a fundamentally new method to be used in upgrading the almost unlimited supply of suitable feedstocks available to Standard Oil Co. (Indiana), and licensees abroad. Its long-range impact upon the field of aromatic and similar chemicals could be considerable. It is possible, for example, that intermediates for fibers, films, plastics, dyestuffs, resins, plasticizers, elastomers, and foams, can now be made from plentiful domestic petroleum sources by the new techniques.

Committee D-1 Meeting

The Spring Meeting of Committee D-1 of the American Society For Testing Materials will be held February 20-22 at the Shoreham Hotel, Washington, D.C.

Committee D-1 is the ASTM group which concerns itself with the study of paints and protective coatings.

George Argent Dies

George G. Argent, veteran salesman of Titanium Pigment Corp., a subsidiary of National Lead Co., died on January 10 in St. Louis. He was 63 years of age.

Mr. Argent joined the organization with National Pigments and Chemical Co. in 1933. He was transferred to Titanium Pigment Company, Inc., which in 1936 became Titanium Pigment Corp.

Reichhold Affiliate Builds

Reichhold Chemicals, Inc., reports that Resins, Incorporated, is building a new plant in Manila, P.I., for the manufacture of synthetic resins. This associated company will operate the plant under license from RCI using its technical knowledge and processes.

The new plant will produce resins for the expanding paper, surface coatings and lumber industries in the Philippines. Plant capacity, initially, is expected to be six million pounds annually.

NEWS

NYPVLA To Hear Talk On Triglyceride Oils

Conrad J. Campbell of Hercules Powder Co. will present a paper entitled "The Alcoholysis of Triglyceride Oils with Pentaerythritol" before the Vehicle Group of the New York Paint, Varnish and Lacquer Association on Wednesday, February 12. Mr. Campbell is Supervisor of all product application research for the Synthetic Department at the Hercules Research Center in Wilmington, Del.

C. J. Campbell

In addition to the featured speaker, Hercules will have a panel in attendance at the meeting. This panel will consist of Dr. A. A. Albert, Manager of Research, Synthetics Department; J. G. Little, Sales Manager—Polyols, Synthetics Department; R. P. Silver, Alkyd Development and Products Application Research Chemist, and F. G. Oswald.

An abstract of Mr. Campbell's paper on "The Alcoholysis of Triglyceride Oils" follows:

Many millions of pounds of soybean and other natural triglyceride oils annually are alcoholized with pentaerythritol in order to use them effectively in alkyd resins. This alcoholysis reaction is, for the most part, conducted and controlled in an empirical fashion using techniques largely borrowed from the older art of alcoholizing triglyceride oils with glycerin. Under these conditions, it is not surprising that unexplained difficulties are sometimes encountered.

As a first step in an effort to find out, if possible, more effective ways to carry out these pentaerythritol reactions and to control them with more certainty, it was apparent that a much more accurate and detailed knowledge of the chemistry of this alcoholysis was required than has been reported in the literature. Many fundamental aspects of the problem were, therefore, examined and the results are reported in this paper.

Methods of quantitative analysis of the products formed during alcoholysis and at the end point when "equilibrium" is said to be established have been studied and are discussed.

The rate of the alcoholysis reaction has been given special attention and an hypothesis drawn that it can accurately be measured by the rate of disappearance of free pentaerythritol. A novel method for quick quantitative determination of PE has been devised and applied in a tentative way as a control test to tell when "equilibrium" has been attained.

Solubility of free PE in the alcoholysis mixture has been examined and a report is given of the findings of the correlation of this solubility with the reaction rate.

A limited study of the influence of different catalysts on the rate of the alcoholysis reaction has been carried out and is reported. The effect of concentration of litharge as the alcoholysis catalyst on the formation of haze in alkyds has been examined.

These data, it is hoped, will help to increase the understanding of vehicle chemists of the triglyceride oil—PE alcoholysis reaction and to spawn new ideas for improving their own plant methods for carrying out and controlling this commercially important reaction.

AZI Pigments Committee Schedules Club Talks

John L. Kimberley, Executive Vice President of the American Zinc Institute has announced that the Institute's recently formed Zinc Pigments Committee is expanding its series of panel discussions on "Exterior House Paints," so that it will be heard by additional paint clubs.

According to Mr. Kimberley, the panel's initial appearances in St. Paul, Minn., and Pittsburgh, Pa., stimulated such strong audience interest and participation that the Pigments Committee was encouraged to try to reach a broader audience.

In its presentation, the panel reviews the function of and the need for zinc oxide in exterior house paints. It describes the performance of conventional house paints formulated with zinc oxide in combination with other pigments in oils, both straight and modified.

The panel also presents the results of exhaustive tests on special low lustre paint formulations using zinc oxide. They demonstrate such advantages of zinc oxide bearing paints as durability, opacity to ultra-violet light, tint retention, self-cleansing action, and superior mildew resistance.

The Institute's Zinc Pigments Committee arranged to hold appearances before Paint & Varnish Production Clubs in Philadelphia, January 16; Cleveland, January 18; Chicago, February 4; Dayton, Ohio, February 11; Kansas City, Mo., February 14; Buffalo, N. Y., March 4; New York City, March 7; Baltimore, March 8; St. Louis, April 16; Houston, Texas, April 27; Oakland, Calif., May 20; and Tacoma, Wash., May 25. It also set up the discussions as part of the Seventh Advanced Paint Refresher Course, July 22 through August 2 at North Dakota State College in Fargo, N. D.

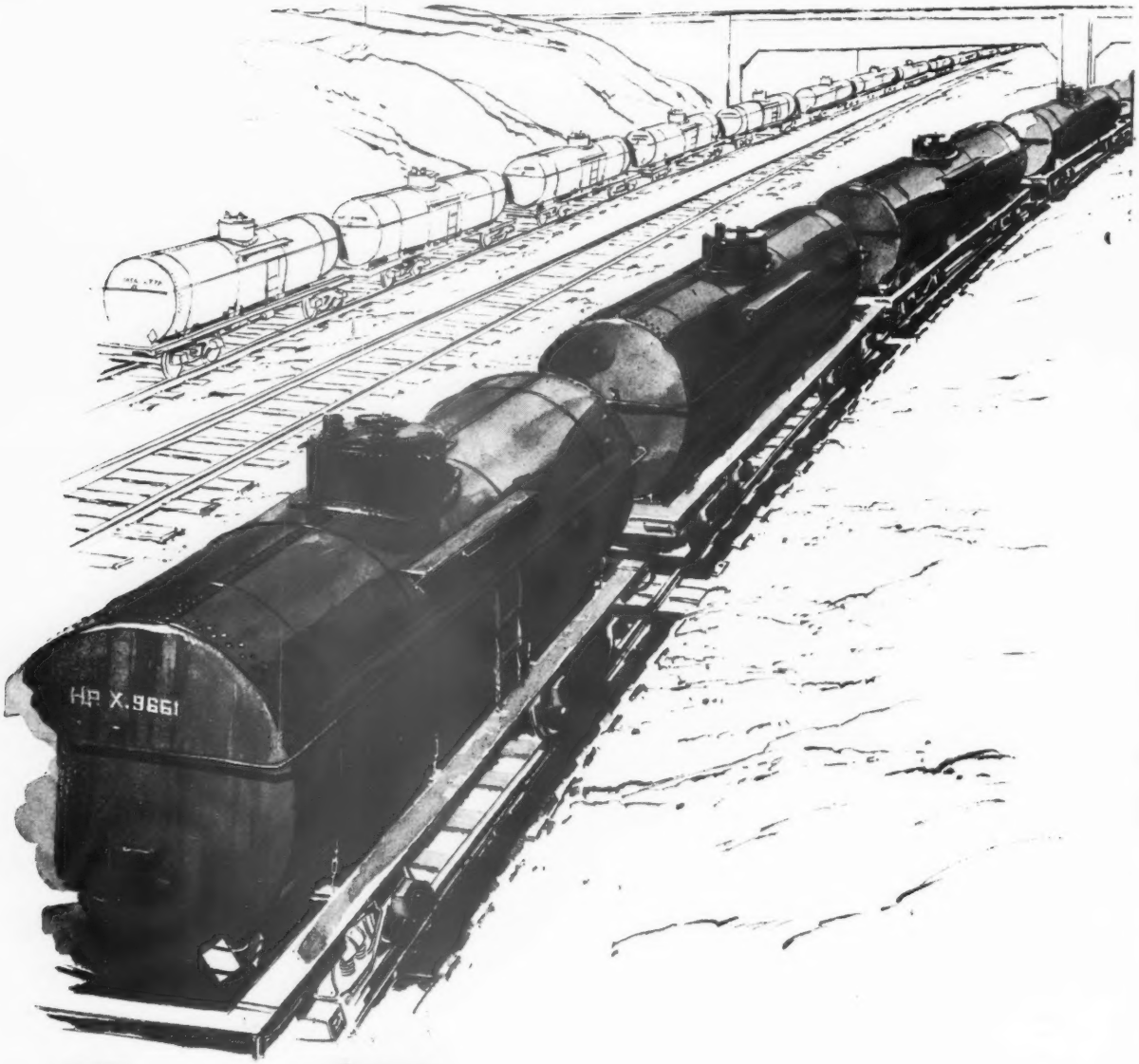
The AZI panel is composed of paint authorities who are active in the field of zinc oxide production, Mr. Kimberley reported. Panel members are: Clovis H. Adams, Director of Mineral Products Laboratory, Sherwin-Williams Co.; John H. Calbeck, Director of Research, Pigment Division, American Zinc Sales Co.; Dr. A. C. Elm, Supervisor of Chemical Research, New Jersey Zinc Co.; Lewis P. Larson, Paint Service Director, American Zinc Sales Co.

Also, J. A. Reising, Research Engineer, Zinc Smelting Division, St. Joseph Lead Co.; Robert F. Schwartz, Research Chemist, Pigment Division, American Zinc Sales Co.; Sidney Werthan, Supervisor of Paint Research, New Jersey Zinc Co.; and Paul Whitford, Manager, Technical Service Department, The Eagle-Picher Co.

TECHNICAL CENTER: Architect's drawing shows $3 million Atlas Powder Company Technical Center, for which ground was broken on January 17. The center, located next to the company's general offices in Wilmington, Del., will house the Atlas Chemical Research and Product Development Departments.

Dependable . . .

Car . . . after car . . . after car



Cargill Incorporated

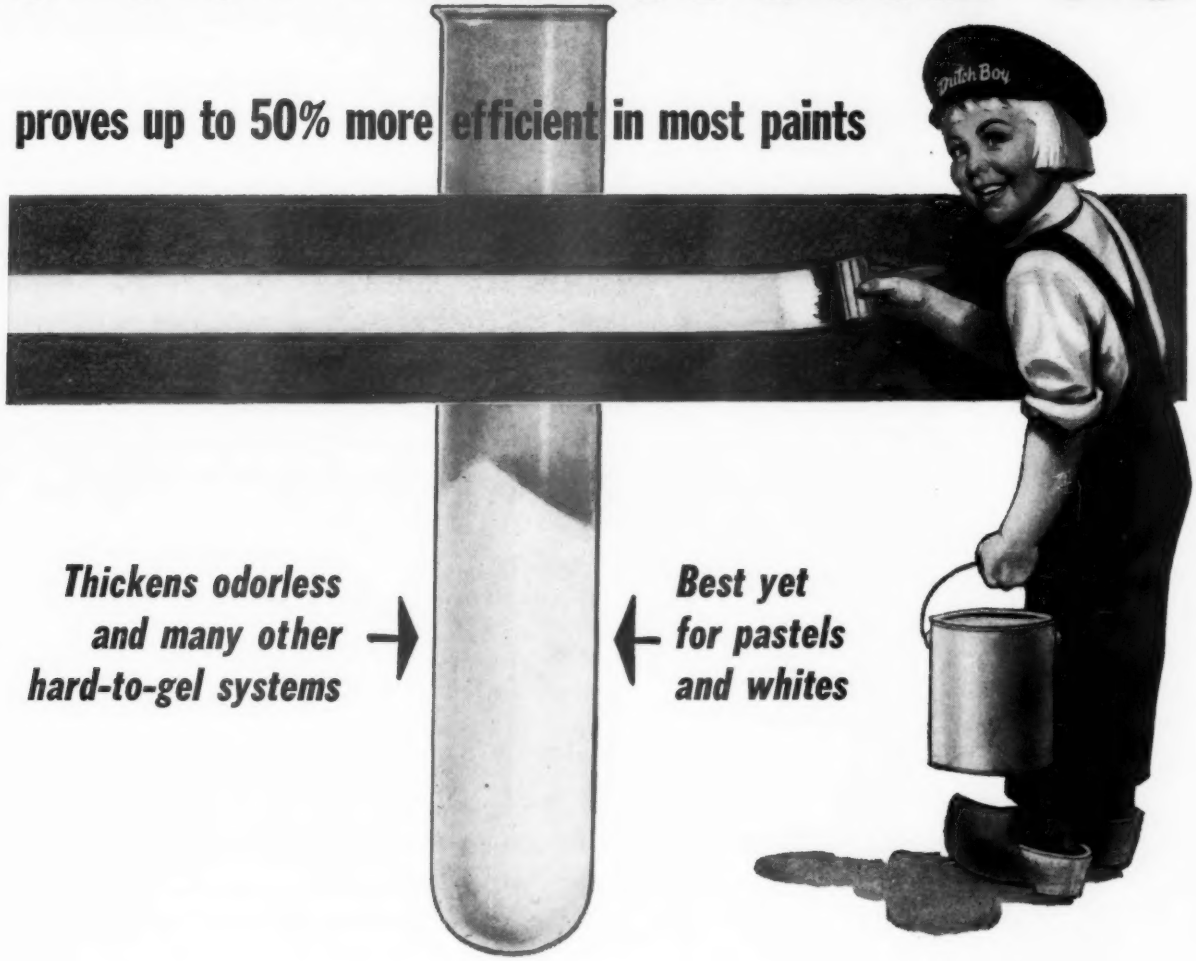
PRODUCTS OF Cargill CREATIVE PROCESSING

Suppliers to the Paint and Varnish Industry

Linseed Oil • Soybean Oil • Fish Oil • Alkyd Resins • Specialty Products

New "Dutch Boy" gelling agent... BENTONE® 38

proves up to 50% more efficient in most paints



Now National Lead gellant research brings you BENTONE 38 . . . a brand-new "Dutch Boy" BENTONE that works wonders for paints.

For example, tests show that BENTONE 38 is up to 50% more efficient in bodying standard paints.

Proves highly versatile, too

Take odorless mineral spirits. Take lacquer thinners. BENTONE 38 produces stable, thixotropic gels in both. And in most in-between solvents. Thus it bodies odorless and other hard-to-gel paints with ease...brings them the familiar "Dutch Boy" BENTONE benefits.

BENTONE 38 *also improves many non-paint organic compounds . . . cosmetics, waxes, adhesives, non-systemic pharmaceuticals, to name a few.*

AIDS COLOR-SENSITIVE SYSTEMS

In pastels and whites, BENTONE 38 simplifies color compounding two ways. First, it is the lightest of all "short" gellants in color. Second, less need be added.

In enamels, varnishes, lacquers, BENTONE 38 aids color compounding, as above, and also provides less flatting action.

In baked finishes, vinyl resin systems, BENTONE 38 provides desirable low reactivity (and hence minimum discoloration) during the baking cycle. It also stops sag.

Want technical details? Write address below for just-published brochure.

Dutch Boy® CHEMICALS

NATIONAL LEAD COMPANY
111 Broadway, New York 6, N. Y.
In Canada: CANADIAN TITANIUM PIGMENTS LIMITED
630 Dorchester Street, West, Montreal
1428 Granville Street, Vancouver 2, B. C.

HARSHAW
AURASPERSE
COLORS

Service of the largest manufacturer of diversified water-dispersions of colors available for all formulation requirements

EMULSION PAINTS
Polyvinyl Acetate
Styrene-Butadiene
Acrylic

LATEX COMPOUNDS
PAPER COATINGS
LEATHER FINISHES

IMMEDIATE ATTENTION *will be given to your requirements for any aqueous color dispersion of* — Organic or Inorganic Pigment
Oxide or Earth Color
Full Strength or Reduced

FULLY ADJUSTED *to your formulation* — Compatible
Non-flooding
Non-streaking
Economical

Manufactured by ZINSSER & CO., Inc.
SUBSIDIARY OF
THE HARSHAW CHEMICAL CO.
CLEVELAND 6, OHIO

HARSHAW

SAMPLES
and further information will be gladly furnished
ON REQUEST

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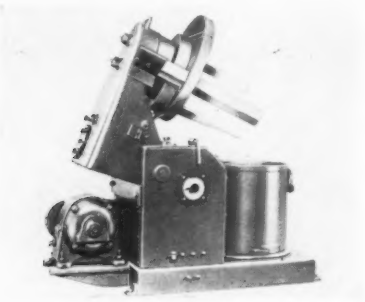
NEW MATERIALS & EQUIPMENT

A MONTHLY MARKET SURVEY

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.



HILDEBRAND

DOUBLE PADDLE MIXER
For Small Batch Work

An 8-gallon capacity double paddle mixer, described as suitable for small batch work in mixing paints, chemicals and inks, has just been introduced. It is claimed to be strong enough to withstand strains imposed by heavy mixes.

In the mixer, a 2 hp motor powers blades and can table in a close-coupled drive arrangement. A hand tilting device to lift the paddles is balanced and pivoted for raising and lowering ease. The can cover is integral with the head, and lifts out of the way when the head is raised. The Cincinnati Hildebrand Co., Dept. PVP, 3410 Beekman St., Cincinnati 23, Ohio.

PVA EMULSION
High Water Resistance

A new polyvinyl acetate emulsion with high water resistance, trade-named "Elvacet 84-1100," is designed primarily for use as a vehicle in water-base paints where stability and high water resistance offer important advantages.

Company says "Elvacet" can be used in either exterior masonry paints or interior paints. E. I. Du Pont de Nemours & Company, Inc., Dept. PVP, Wilmington 98, Del.

PUMP GREASE
Resists Solvents

Company announces an entirely new type of grease made especially to overcome the problem of lubricating pumps which are used to handle solvents. The new solvent resistant grease is said to be impervious to the washing action of almost all petroleum and chlorinated solvents.

Further recommendations for the new lubricant are held to be that it remains relatively unchanged in use and that it may be pumped readily in a hand grease gun at extremely low temperatures. Pennsylvania Refining Co., Dept. PVP, 2686 Lisbon Rd., Cleveland 4, Ohio.

ACRA

DRUM HEATER
Electrical Type

A new electrical drum heater is said to provide improved conduction for heating standard 55 gallon steel drums. Known as the "RH-1 Acrawatt," the new model is designed for 22¼" diameter drums containing materials such as plastic resins, oils, adhesives and non-volatile chemicals which require heating to facilitate removal from the container.

Features of the new heater include a new quick-action toggle clamp, built-in three heat switch and wiring circuits said to assure uniform heating at any one of three settings. At high setting, the heater is available in capacities of either 3000 Watts—230 volts or 2500 Watts—115 volts. Acra Electric Corp., Dept. PVP, 9909 Pacific Ave., Franklin Park, Ill.

AMINE-FATTY ACID
For Thickening Solutions

"Monamine # 7-70," a compounded amine-fatty acid condensate is reported to possess unusual thickening characteristics. Company recommends it for use in pigment grinding and in the manufacture of latex paints.

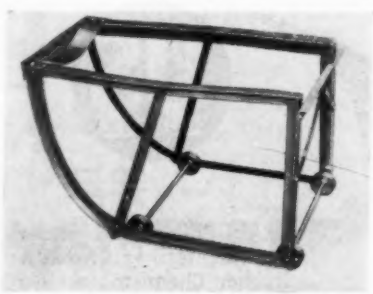
According to the manufacturer, solutions of the "Monamine" fatty amide in distilled water are clear, while in tap water they are slightly hazy. A 10 per cent solution of "Monamine # 7-70" in water is said to produce a viscous liquid. A four per cent solution is held to set up a slow flowing gel with rubbery consistency. Mona Industries, Inc. Dept. PVP, Paterson 4, N. J.

CRADLE TRUCK
For Safe Drum Handling

A new cradle truck for handling barrels or drums features specially designed curved top rails which hold the containers firmly in position and prevent dangerous tipping.

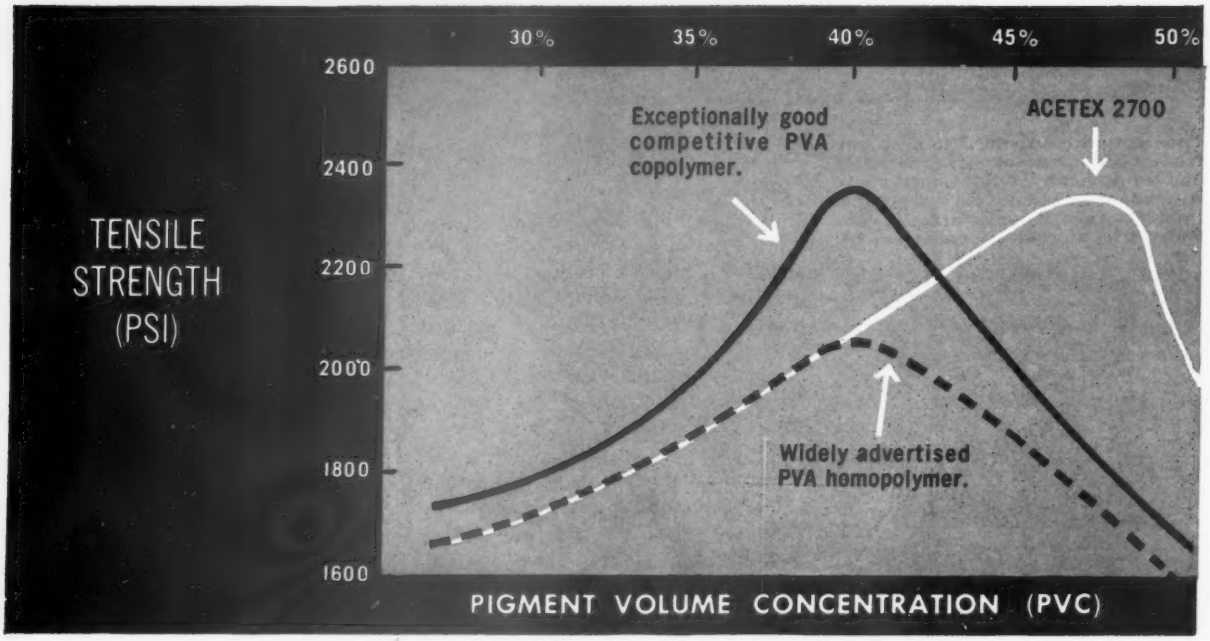
Other safety features include non-skid devices, located directly forward of the front wheels on the rocker, and a safety catch on the nose piece. These prevent the barrels from sliding during loading. Ruggedly built, the truck has an 18-inch wheel base. It is available with four large 3-inch diameter wheels placed on a straight axle. Morse Manufacturing Co., Inc., Dept. PVP, 727 West Manlius St., East Syracuse, N. Y.

MORSE



Naugatuck ACETEX 2700

A new Vinyl Acetate Copolymer Emulsion with extremely small particle size.



cuts cost, improves quality, of PVA paints

You don't have to be a chemist to get the cost-saving significance of the above graph! The white line shows the *film strength*—in relation to pigment volume concentration (PVC)—of a paint formulated with ACETEX® 2700 as the pigment binder. Note that the film reaches its greatest strength at about 48% PVC. Naturally, the ability of a latex to bind *more* pigment means *savings* in your raw material costs.

Fine particle size, approximately 0.2 micron, and new emulsifier system of ACETEX 2700 work together to produce paints with improved binding strength, greater durability, higher gloss, better water resistance, superior stability to freezing and thawing, improved storage properties and tougher films.

These are but a few of many reasons for choosing ACETEX 2700 as the pigment binder for *your* PVA paints. Write us for the new ACETEX technical bulletin which includes suggested formulations for interior wall paint, primer-sealer and exterior masonry paints based on this outstanding, small-particle-size polyvinyl acetate copolymer emulsion.

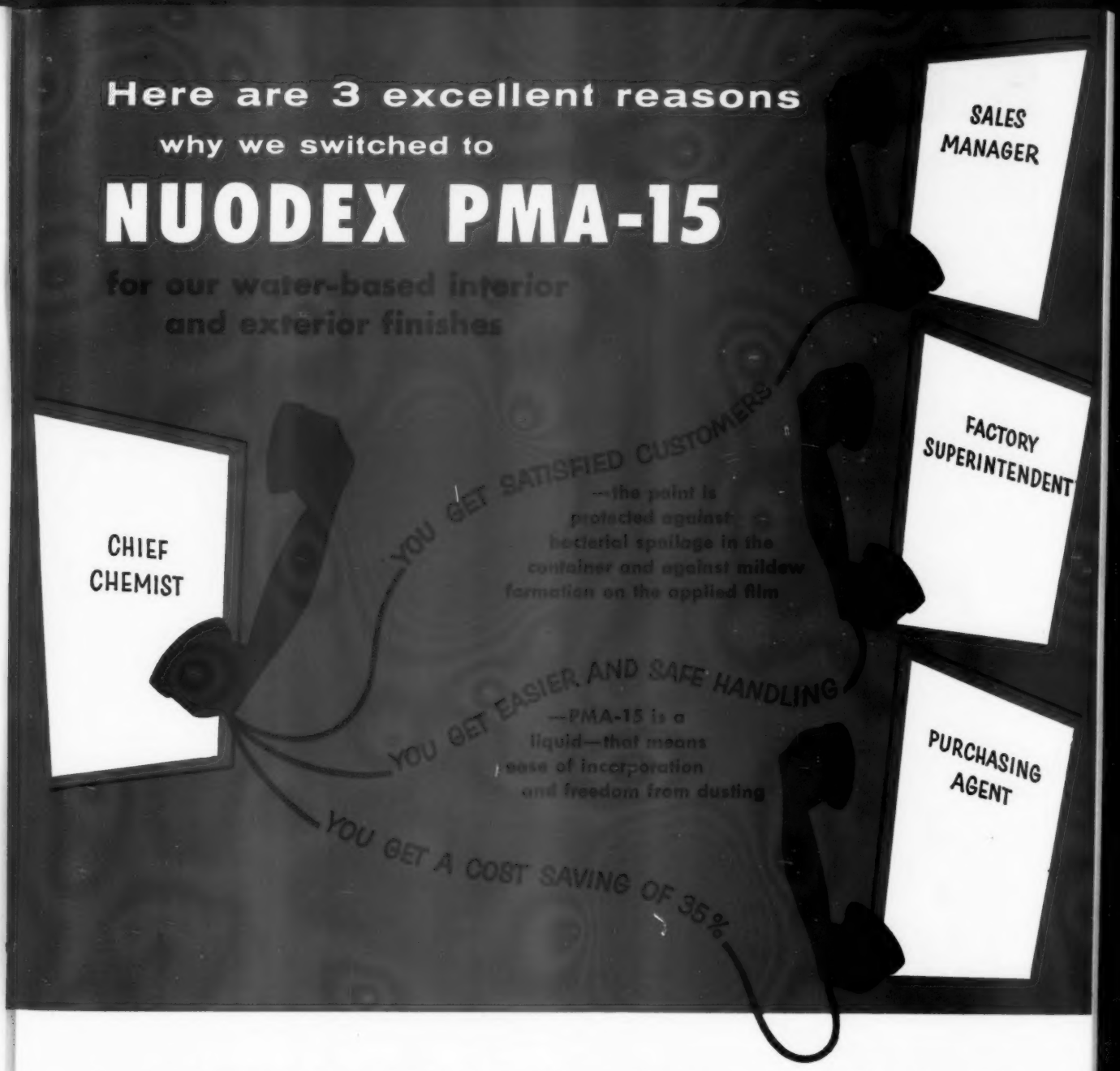
US RUBBER

United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Chicago • Memphis • New York • Philadelphia • **Mfg.:** Naugatuck • Gastonia • Los Angeles • **CANADA:** Latex Div., Dominion Rubber Co., Ltd., Montreal • **Cable:** Rubexport, N. Y.
Rubber Chemicals • Synthetic & Reclaimed Rubber • Plastics • Agricultural Chemicals • Latices



From any viewpoint—in the manufacture of water-based paints—you will find important advantages in using Nuodex PMA-15. This is a solubilized form of phenyl mercury acetate (25-25.5% concentration) containing 15-15.3% mercury as metal. It may be used in any of the standard aqueous systems, including butadiene styrene, polyvinyl acetate, and acrylic types. Extensive laboratory and field experiences attest to the overall effectiveness of Nuodex PMA-15.

To the big advantages named above, add freedom from staining, from pigment flocculation, from latex coagulation. Add stability under freeze/thaw conditions. Recall the 35% cost saving.

You want the full facts on Nuodex PMA-15. Get them now from your Nuodex Representative—or write us direct for working samples and complete product data.

NUODEX PRODUCTS COMPANY, Elizabeth, N. J.
Export: Nuodex International, Inc., 511 Fifth Ave., N.Y.17, N.Y.
A Division of Heyden Newport Chemical Corporation

NUODEX ADDITIVES AND S/P CHEMICALS

TO HELP MAKE GOOD PAINTS BETTER

DRIERS—FUNGICIDES—MIXING AND MILLING AIDS—ANTI-SKINNING AGENTS—LOSS OF DRY INHIBITORS—BODYING AGENTS

NEW MATERIALS — EQUIPMENT

pH METER
Push Button Type

Company announces the new "Zeromatic" pH meter, a line-operated instrument which features automatic correction for electronic zero drift and rapid push button control.

The "Zeromatic" has a 0 to 14 pH scale range and two millivolt ranges: 700-0-700 millivolt range and the extended 0 to 1400 millivolt range. The extended range is said to be particularly useful for oxidation-reduction titrations.

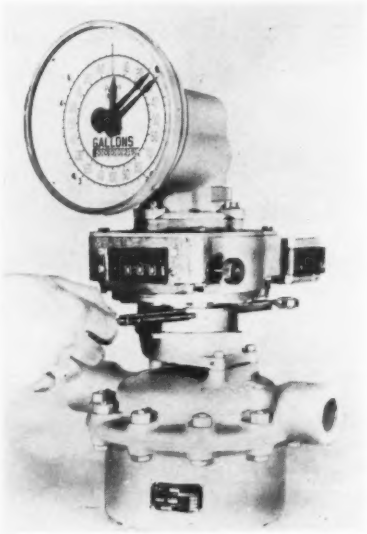
In the new instrument, operator

BECKMAN

reading error is minimized with a mirror-backed scale which eliminates paralax. Scientific Instruments Division, Beckman Instruments, Inc., Dept. PVP, 2500 Fullerton Rd., Fullerton, Calif.

LIQUID METERING SYSTEM
With Explosion-Proof Design

A new explosion-proof control system for industrial liquid metering provides an accessory control switch, a predetermining register and latch box and quantity control valve—all installed at the meter. Upon completion of a predetermined liquid delivery, a switch is automatically thrown, opening an electrical circuit and cutting off simultaneously all liquid flow at the meter and all pumping action.



ROCKWELL

Where repeated deliveries of a fixed amount of liquid are required, a special factory-set predetermining register is available. This saves time on fixed-volume deliveries, by eliminating resetting of the register after each run. Meter and Valve Division, Rockwell Manufacturing Co., Dept. PVP, 400 No. Lexington Ave., Pittsburgh 8, Pa.

ALKYD RESIN EMULSION
Is Solvent-Free

Fire hazards, solvent odors and toxic fumes are said to be eliminated with "Rezamul 1504," a newly-developed, solvent-free paint vehicle. Initial investigations have been confined to industrial applications of air-drying and baking aqueous enamels. Company claims however, the new emulsion will also prove adaptable to various other end uses.

Manufacturer reports that "Rezamul 1504" may be thinned merely by the addition of water, that it

For concrete curing compounds that perform better, specify NEVILLE LX-685 RESIN

Neville LX-685 Resin has proved its superiority in the manufacture of membrane-type concrete curing compounds. Its inclusion in such compounds insures great resistance to early abrasion and after-yellowing, and performance has shown that this resin produces concrete curing compounds meeting U.S. and state government specifications. Neville LX-685 Resin may be obtained in 60% and 70% concentrations in petroleum solvents, as well as in special concentrations and in other solvents to meet individual needs. Use this coupon to write for details.

NEVILLE CHEMICAL COMPANY • PITTSBURGH 25, PA.

NEVILLE

Please send information on Neville LX-685 Resin.

NAME_____ TITLE_____

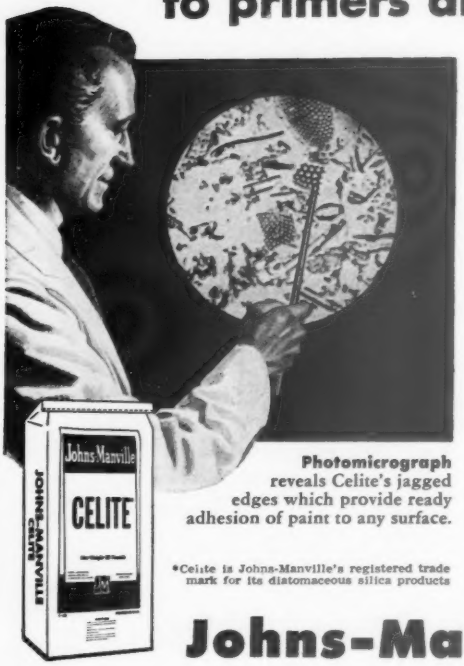
COMPANY_____

ADDRESS_____

CITY_____ STATE_____

NC24-PV

CELITE diatomite pigments add "tooth" and toughness to primers and topcoats



Photomicrograph reveals Celite's jagged edges which provide ready adhesion of paint to any surface.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products

NO ONE examines the performance of paint ingredients more critically than government experts. And time after time, they specify Celite*. These microscopic particles of silica are hard and tough. Suspended in the paint film they provide extra durability for the severe conditions which military and maintenance coatings must withstand. Their irregular shapes projecting through the film anchor primers to any surface . . . give an excellent "tooth" for adhesion of topcoats.

Celite provides control of gloss to any degree including the dead flat finish required for military camouflage coatings. When used as a filler, Celite's high bulking properties hide surface imperfections and ease sanding. The loosely interwoven structure of the tiny particles creates a flexible film highly resistant to cracking.

Special grades of Celite have been developed for many different military and maintenance applications. Write for complete information to Johns-Manville, Box 60, New York 16, N. Y. In Canada, address 565 Lakeshore Road East, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville CELITE THE EXTENDER PIGMENTS FOR ALL COATINGS

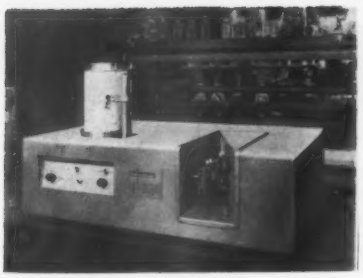
has no flash point or objectionable odor, and that it possesses excellent mechanical and thermal stability. Finishes made with "Rezamul" as the sole vehicle are described as exhibiting excellent gloss, together with good film integrity and durability. Reichhold Chemicals, Inc., Dept. PVP, White Plains, N. Y.

LaPINE

HEATER & STIRRER
For Water Baths

The "Tempunit," a new apparatus for operating laboratory water baths, combines a self-contained heater, controller, stirrer, and circulator with a completely built-in pneumatic control system sensitive within ±0.05° C. Compact in construction, the unit measures only 10 inches in overall length and weighs only 5½ pounds.

In the "Tempunit," a bimetallic helical temperature-sensing element operates a pneumatic capsule, which receives its air supply through suction from the 6-bladed stirrer. Suction produced by the stirrer also enables the "Tempunit" to circulate 1 liter per minute to external instruments such as refractometers and viscosimeters while closely controlling an uninsulated 4-gallon water bath. Arthur S. LaPine & Co., Dept. PVP, 6001 South Knox Ave., Chicago 29, Ill.



PERKIN-ELMER

SPECTROPHOTOMETER
Double-Beam, Infrared Type

Company announces the "Infracord Spectrophotometer" as a new low-cost, double-beam, infrared instrument for use by the organic chemist at his bench. According to the manufacturer, the analytical instrument which sells for less than $5,000 will provide considerable versatility.

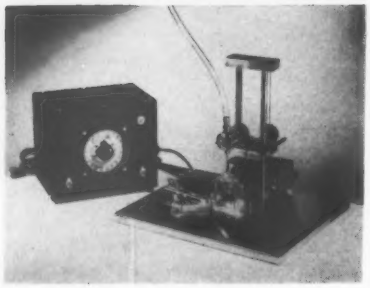
The spectrophotometer, reportedly, may be used for fast purity checks of raw materials, for recording the progress of an organic synthesis, for molecular structure elucidation and for precise quantitative analysis. Perkin-Elmer Corp., Dept. PVP, Norwalk, Conn.

GLASS BEADS
Reflective & Free Flowing

Manufacturer of reflective glass beads for highway markers and signs claims that its new Free Flowing Glass Beads will store for an unlimited period without lumping up in storage. It is said that the beads feature a marked re-

sistance to high humidity and consequent reduction in maintenance costs.

Time is saved by use of the new beads, according to the company, since it is no longer necessary to clean dispensing equipment at the end of the day. Additionally, beads reportedly may be left in the hopper overnight, eliminating the necessity of screening and drying out prior to use. Flex-O-Lite Manufacturing Corp., Dept. PVP, 8301 Flex-O-Lite Dr., St. Louis 23, Mo.



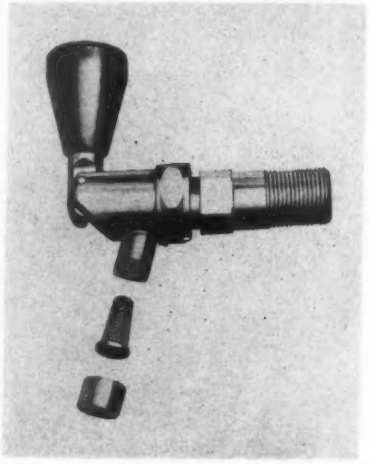
NORTH AMERICAN

LIQUID FILLER
Is Semi-Automatic

A versatile, new, semi-automatic liquid filler is designed for efficient short or long runs in filling small bottles and containers. The fill is controlled by a timed flow. Timer is adjustable to 1/60th of a second.

Features reported for the filler are that it is easily portable, sets up easily in a few minutes and is adaptable to almost any size opening. Position of the valve-spout assembly is claimed to be adjustable up and down or backward and forward.

According to the manufacturer, the filler takes only two square feet of table space. It can be gravity fed or pressure fed. North American Electric Corp., Dept. PVP, 1713 So. Halsted St., Chicago 8, Ill.



ECONOMY

STAINLESS FAUCET
For Dispensing Solvents

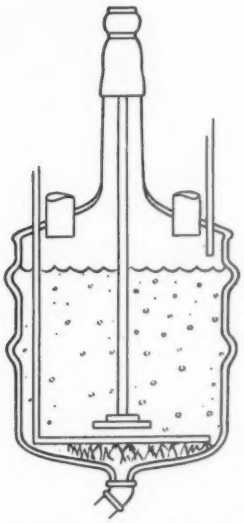
An improved corrosion-resistant faucet, "Model U-008," has been made available for dispensing corrosive and inflammable fluids in the chemical industries. Fabricated of stainless steel throughout, the unit is reported to have the approval of The Factory Mutual Engineering Division of Factory Mutual Laboratories.

In the design and construction of the new faucet, metal to metal contact has been eliminated by the introduction of Kel-F fluorocarbon seal rings. Additionally, an anti-flash screen is said to successfully prevent propagation of any flames which might enter the storage drum through the spout.

The new faucet can be disassembled for cleaning, and because of materials of construction, can be chemically and/or steam sterilized. Economy Faucet Co., Dept. PVP, 12 New York Ave., Newark 1, N.J.

CO_2 Proves New Aid to Resin Production—Cuts Costs—Improves Quality—Saves Time

Actual Tests Prove CO_2 Cuts Oil Cooking Time 2/3!



Actual tests conducted in the laboratories of a major manufacturer* produced these conclusive findings:

CO_2 sparging, added to conventional mechanical agitation, cuts cooking time from 720 to 235 minutes! To achieve this remarkable saving, CO_2 functioned in 2 important ways—

1. Sparged up through the mixture, CO_2 markedly increased agitation, causing faster, more even cooking.
2. Water is "swept" away. Passing up through the mixture, the CO_2 bubbles absorbed water vapor from the product—allowing the mixture to reach the desired cooking temperature sooner.

Tests Verify Another Important Fact—CO_2, when sparged through the reaction mixture, inerts it—effectively inhibits oxidation—color stays desirably light and constant.

*Name on request

Assures Quality Esterification

CO_2 furnishes the ideal inert atmosphere for water removal during esterification reaction. Efficient water removal is of vital importance in all esterification reactions—including alkyd resins, plus all oils, fatty acid esters, rosin esters or varnish—to prevent reverse reaction.

Thinning

CO_2 in thinning tank retards oxidation, provides a fireproof "blanket."

Storage

CO_2 "blanket" in storage tank prevents "skinning."

Transfer

Under pressure from the CO_2 System, carbonic gas is the safest transfer medium for flammable fluids.

Filtration

CO_2 used to purge filters recovers the oil from the filter, substantially reduces cleaning time and frequency of cleanings.

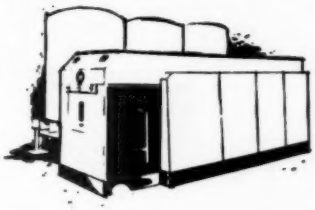
Packaging & Transport

Inerting with CO_2 prevents "skinning," eliminates costly cleanouts.

Flash Fires

As inert, heavier-than-air "blanket," CO_2 gas effectively displaces oxygen, eliminates possibility of fire or explosion.

LIQUIFLOW CO_2 SYSTEM



Manufactured by The Liquid Carbonic Corporation. This unit assures a constant supply of chemically pure CO_2 anywhere in your plant. Let experienced LIQUID engineers show you how an integrated Liquiflow CO_2 System will improve your product and lower your operating costs.

World's Largest Producer of

THE LIQUID CARBONIC CORPORATION

3128 South Kedzie Avenue
Chicago 23, Illinois

FREE BULLETIN

Gives complete details on the uses above plus other important CO_2 applications in the paint and varnish industry. Send for your copy of "The Use of CO_2 in Paint, Varnish and other Alkyd-Type Resin Manufacturing."

THE LIQUID CARBONIC CORPORATION
3128 South Kedzie Ave., Chicago 23, Illinois

Please send me your technical bulletin on the uses of CO_2 in the paint and varnish industry.

Name_____

Title_____

Company_____

Address_____

City_____ Zone___ State_____

PERSONNEL CHANGES

ACORN PAINT

E. P. Lawrence will assume the newly created position of Special Representative at Acorn Paint & Chemical Co., Cleveland, Ohio. In that capacity, he will be responsible for developing the distributor and jobber business.

A graduate of Ohio State University, Mr. Lawrence was formerly associated with Boston Varnish Co. and most recently was General Manager at Kyanize Paints, Inc., Springfield, Ill.

BATTELLE

Dr. B. D. Thomas has been selected by the Board of Trustees as the new Director of Battelle Memorial Institute, Columbus, Ohio. In this position, he succeeds Dr. Clyde Williams, President of the Institute, in the management of Battelle's research operations in the United States and Europe.

B. D. Thomas

A member of the Institute's executive and technical staff since 1934, Dr. Thomas was appointed Assistant Director in 1942. Subsequently, he was named Secretary of the Battelle Memorial Institute Corp. and in July, 1955, he became Vice President.

R. A. Nagel

H. G. Chagnon

SPENCER KELLOGG

Richard A. Nagel has been appointed District Sales Manager for Spencer Kellogg and Sons, Inc., in charge of their Philadelphia sales territory. In that capacity he succeeds Joseph A. Morris, recently deceased.

Mr. Nagel became associated with the Kellogg organization in 1934, at which time he was assigned to the Technical Service Department and Laboratory in Buffalo, N. Y. Later, in 1949, he was advanced to the position of Eastern Division Technical Service Manager, responsible for the entire Atlantic Seaboard area. He now leaves this role to take up his new duties.

Concurrent with Mr. Nagel's appointment, Spencer Kellogg has also named **Harold G. Chagnon** as Assistant District Sales Manager for the Philadelphia territory. He will serve as the first assistant to Mr. Nagel.

Mr. Chagnon entered the employ of the company in 1929, as a clerk in the linseed Oil Department, Buffalo. During that same year he was transferred to the company's district sales office in Philadelphia, which has been his headquarters since.

AMERICAN ZINC

William J. Bolin has been appointed Central District Sales Manager for the American Zinc Sales Co.

Mr. Bolin joined American Zinc in 1947 in the sales department of the New York office. He was transferred to the sales office in Columbus, Ohio, in 1949 and has covered the Ohio, Indiana, and Pennsylvania area since that time.

For the new position, Mr. Bolin will retain his present headquarters in Columbus, Ohio.

SAPOLIN PAINTS

E. Albert Eckart, Jr., has joined the New York sales staff of Sapolin Paints, Inc. He represents the fourth generation of the family which founded this paint firm. His father, E. A. Eckart, Sr., is currently serving as president.

Born in New York City, Mr. Eckart, Jr., attended Yale University and the University of Vermont. He served 3½ years with the United States Navy, terminating his service as Executive Office of the U.S.S. Kent County.

Many companies in your industry depend on Skellysolve for exacting quality, prompt shipment, and expert technical service. Get more complete facts by writing or calling us today at LOgan 1-3575, Kansas City, Missouri.

Skellysolve for Paint, Varnish and Lacquer Manufacture

SKELLYSOLVE-L. A quick-evaporating lacquer diluent of exceptionally sweet odor. Closed cup flash point about 12°F.

SKELLYSOLVE-S. Low end point mineral spirits for thinning paints, varnishes, and polishes. Closed cup flash point about 103°F.

SKELLYSOLVE-S2. A quick-evaporating mineral spirits. Closed cup flash point about 101°F. Excellent for industrial paints and for polishes and waxes.

SKELLYSOLVE-V. Narrow boiling range VM&P naphtha. Excellent for dip and spray enamels. Closed cup flash point about 50°F.

SKELLYSOLVE-T. High boiling mineral spirits for longer wet edge. Closed cup flash point about 140°F.

SKELLYSOLVE-X. A heavy, slow drying naphtha having a high flash point. Used to increase the wet edge time, to give better flow and leveling characteristics tending to eliminate brush and lap marks in hot weather.

Ask about our new Skelly Petroleum Insoluble Grease and wide range of aromatics.

SKELLY **Skellysolve**

SKELLY OIL COMPANY
Industrial Division
605 West 47th Street, Kansas City 41, Mo.

PRATT & LAMBERT

Four promotions in the company's research and development organization have been announced by R. W. Lindsay, President of Pratt & Lambert, Inc.

E. J. Zimmer and **N. J. Miller** have been appointed Associate Technical Directors. Mr. Zimmer joined the company in 1932 and has directed its Architectural Enamel and Paint Laboratory since 1945. Mr. Miller has been with the company since 1934 and has directed its Industrial Enamel and Lacquer Laboratory since 1945.

W. G. Ringle has been appointed General Research Chemist, while **M. S. Armstrong** has been named Research Associate. Mr. Ringle and Mr. Armstrong joined the company in 1934 and 1923, respectively. Both men have been closely identified with Pratt & Lambert, Inc. research in the field of resin technology.

PATTERSON FOUNDRY

Richard G. Griffoul has been named Manager of Manufacturing for The Patterson Foundry and Machine Co., it was announced by C. W. Gerster, President.

Mr. Griffoul had been works manager of General Electric's Gearmotor and Transmission Components Department in Patterson, N. J. He is a graduate of the U. S. Naval Academy.

BARRETT

Edward Lupsiewicz has joined the Research and Development Department staff of the Barrett Division, Allied Chemical & Dye Corp.

With 10 years of previous industrial experience, Mr. Lupsiewicz will be engaged in technical service work on plasticizers at Barrett's Shadyside Applications Research Laboratory in Edgewater, N. J.

NATIONAL ANILINE

William J. Urbowicz has been named Product Manager of Alicyclic Chemicals by National Aniline Division, Allied Chemical & Dye Corp.

W. Urbowicz

In his new position, Mr. Urbowicz will be concerned with the promotion of alicyclic products in liaison with Barrett Division. He will report to Dr. L. W. Seigle, Manager, Chemical Intermediate Sales.

Mr. Urbowicz, previously employed in a chemical sales capacity by Stauffer Chemical Co., became associated with National Aniline in 1955, in the sale of isocyanates, nylon and miscellaneous chemicals. He has also had experience in control and production with the National Lead Co.

ORONITE CHEMICAL

H. E. Bramston-Cook has been elected a member of the Board of Directors of Oronite Chemical Co., chemical subsidiary of Standard Oil Co. of California.

Mr. Bramston-Cook, now Vice President of the company stationed in New York, will be responsible for industry relations and for coordinating company policies in the Eastern United States.

Other Oronite personnel shifts include appointment of **N. E. Hathaway** to the position of General Sales Manager, with headquarters in San Francisco.

Mr. Hathaway will be replaced as Coordinator of Marketing by **J. R. Stitt,** who will, in turn, be succeeded as Eastern Regional Sales Manager by **T. M. Welton.**

SUYDAM DIVISION

George P. Myers has been named Manager and **John A. Burke, Jr.,** Sales Manager for the Suydam Division of Pittsburgh Plate Glass Co.

Mr. Myers, formerly Sales Manager for the Suydam Division during the past two years, succeeds **Stuart Brown, Jr.,** who has retired following 30 years of service in the paint industry. Mr. Myers joined Pittsburgh Plate in 1937 and has since served in industrial paint sales at the Newark, N. J., Paint Division and the Pittsburgh general office.

Prior to his appointment, Mr. Burke had served as Assistant Director of Sales, Transportation Finishes, in the company's general office since 1954. He also has been associated with Pittsburgh Plate since 1938 in paint sales and technical service positions at both the Newark and Springdale, Pa., Paint Divisions.

We're on Stream!

New Phthalic Anhydride Plant Doubles Pittsburgh Coke's Output of Essential Material

PITTSBURGH COKE is now *producing* and *shipping* from its new multi-million dollar phthalic anhydride plant!

Under construction since last year, this efficient new production unit is engineered to keep pace with the chemical industry's steadily growing needs for basic supplies of high purity phthalic in both flake and molten form.

Now, more than ever before, you can count on Pittsburgh for the prompt deliveries and uniform phthalic quality that eliminate many of your production troubles.

Call in a Pittsburgh man today! He'll show you how to solve your P.A. supply problems *before* they happen—by going with Pittsburgh in '57!

CALL

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PITTSBURGH
ATlantic 1-2290

CLEVELAND
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COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

McDANEL laboratory mill jars give maximum service with minimum breakage

Accurately duplicate ball mill grinding action. Easy to handle, discharge and clean. Fully glazed outside; unglazed inside. PRJ-1G has recessed hardware for smoother roller mill operation.

Close-fitting covers prevent leakage; can be tightened by hand. Equipped with Neoprene or rubber gaskets. (Neoprene recommended for oil base grinding.) Quart, gallon and two-gallon sizes. Ball charge included.

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REFRACTORY PORCELAIN COMPANY
BEAVER FALLS · PENNSYLVANIA

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Now for house paint formulations

EAGLE-PICHER
414 ZINC OXIDE
LEAD FREE
wets easier, faster!
reduces oil demand!

Now, after years of extensive research and development in the Eagle-Picher laboratories, the new 414 Zinc Oxide has been "fence-tested" and proved on the job. It provides these unique and highly desirable features in your house paint formulations:

- **Reduced oil demand! Saves money!**
- **Increased gloss retention!**
- **Superior mildew resistance!**
- **Improved blister resistance!**
- **Greater film flexibility!**
- **Easier, more uniform brushing qualities.**

AND REMEMBER . . .

Eagle-Picher maintains rigid quality control from ore to finished pigment . . . and as the largest producer of *both* zinc and lead pigments, provides unequalled and unbiased customer service.

Since 1843

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THE EAGLE-PICHER COMPANY

Largest Producer of Both Zinc and Lead Pigments

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U.S.P. glycerine from local stocks

Now you can get Dow's U.S.P. Synthetic Glycerine from local stocks. For prompt service and personal attention call us today. Sample for evaluation available upon request.

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CENTRAL SOLVENTS & CHEMICALS CO.
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Chicago 12, Illinois

DIXIE SOLVENTS & CHEMICALS CO.
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Louisville 16, Kentucky

HOOSIER SOLVENTS & CHEMICALS CORP.
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Indianapolis 22, Ind.
Nelson Road East—Anthony 0213
Fort Wayne 8, Ind.

MISSOURI SOLVENTS & CHEMICALS CO.
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St. Louis 7, Missouri
2522 Nicholson Ave.—CHestnut 1-3223
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2900 Vinson Street—FEderal 1-5428
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2540 West Flournoy Street • Chicago 12, Illinois

F. A. Kusta

J. Carson

VULCAN STEEL CONTAINER

Fred A. Kusta has been named General Plant Manager and **John Carson,** Superintendent of Vulcan Steel Container Co., Birmingham, Ala.

Mr. Kusta has had many years of experience in pail and drum manufacturing and management. He previously was affiliated with Inland Steel Container Co., Cleveland, Ohio, and with Cleveland Steel Barrel Co. He has also been in the tool, die, and machinery building business.

Mr. Carson, too, has had many years of production, tool, die and machinery experience in can, pail and drum making. In recent years he has been in the container business in Ohio, having served with Cleveland Steel Barrel Co., Fram Corp. and Inland Steel Container Co.

CARBIDE and CARBON

R. K. Turner, a vice president of Bakelite Co., has been appointed as a vice president of Carbide and Carbon Chemicals Co. Mr. Turner's activities will be concerned with plastics operations of both companies which are divisions of Union Carbide and Carbon Corp.

Mr. Turner began his association with Union Carbide in 1924 in the Research Department of Carbide and Carbon Chemicals Co. at Clendenin, W. Va. He progressed through the Chemicals organization to Superintendent of the South Charleston plant in 1940, and, in 1946, he moved to New York to fill the post of Assistant Works manager for the company. He was appointed Vice President, Production, for Bakelite Co. in 1952.

Four technical representatives, after completing their training at Mellon Institute of Industrial Research, have been assigned to sales offices of Carbide and Carbon Chemicals.

The assignments are: **M. R. Carbone** to the Los Angeles District, **J. R. Conaway** to the General Sales Office in New York, **J. A. Francis** to the St. Louis District, and **A. F. Murray** to the Pittsburgh District.

BROWN-ALLEN CHEMICALS

John W. Reid has announced his resignation as Vice President of Brown-Allen Chemicals, effective January 1. He disclosed no future plans.

CIBA

Dr. Stanley F. Kudzin has been appointed as Technical Supervisor for the Pigments Department of Ciba Company, Inc. He joins Ciba after five years with the Du Pont Pigments Department in Newark, N. J., where he was active in both pigment research and in pigment technical sales service.

In the Plastics Division of Ciba Company, Kimberton, Pa., there have also been three other appointments. **G. M. Scales** has been promoted to the position of Technical Sales Manager, **Elliott N. Dorman** becomes Assistant Technical Sales Manager, and **J. B. Durra** is newly assigned as Advertising and Sales Promotion Manager.

BETTER FINISHES

Robert L. Driscoll has joined Better Finishes and Coatings, Inc., Newark, N. J., as New England Representative for the company's complete line of products. He will make his headquarters in Winthrop, Mass.

Prior to joining Better Finishes. Mr. Driscoll represented the Keystone Paint and Varnish Co., Brooklyn, N. Y. in both New England and in Ohio. Before that he was Assistant Manager of the Trade Sales Order Department, Carpenter-Morton Co.

PACIFIC VEGETABLE OIL

R. H. Allison has joined the staff of Pacific Vegetable Oil Corp., according to an announcement by B. T. Rocca, Sr., company president.

Mr. Allison, a graduate of Harvard Law School, is known throughout the fats and oils industry as one of the leading brokers for tallow and related commodities. He is the founder of R. H. Allison and Co., which firm will continue in business under the management of his present associates.

NEW!

From P.V.O.'s Research and Development Division

METHYL LINOLEATES

Methyl Linoleate-ML, Bleached Methyl Linoleate-MLB, Conjugated Methyl Linoleate-ML22—All Produced From Safflower Oil

Here are some of the important advantages these new vehicles offer polymer and alkyd manufacturers.

EXCELLENT PERFORMANCE—high percentage of non-yellowing linoleic esters, practically no linolenic, low saturated fatty acid content . . . fast drying, good color retention, better flexibility.

HIGH VERSATILITY—liquid form means easier handling . . . use requires no lengthy research . . . can be used with only slight modification in place of existing raw materials . . . cuts down polyol limitations.

LOW COST—low in cost compared with fatty acids . . . will sell in same range as Safflower oil . . . prices are based on the stable Safflower oil price.

Write today for samples, details, and free booklet!

62 Townsend Street,
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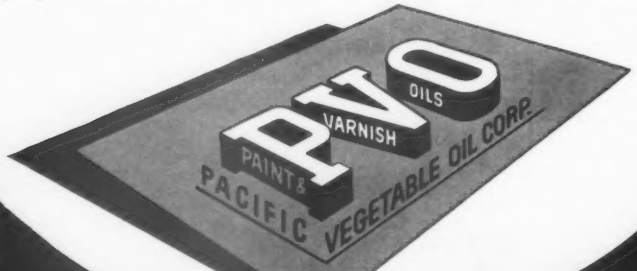


DOW CORNING

R. E. Vidal, former Assistant Manager of Leather Industry Sales at Dow Corning Corp., has been promoted to Manager of Resin Sales. He succeeds **L. F. Stebleton,** who has been assigned to a group forming the company's New Products department.

R. E. Vidal

Mr. Vidal joined the company in 1951 as a member of the Product Engineering Laboratories. Later he entered a sales training program and was assigned to the Cleveland branch office in July, 1952, as a technical representative.

During his Cleveland service, Mr. Vidal's accounts included the paint industry in southern Ohio, Kentucky, and part of West Virginia. He was recalled to the Midland, Mich., offices in 1955 to assume the Assistant Managership of Leather Industry Sales.

HAWTHORN CHEMICAL

James W. Cleary has been named Works Manager of the methyl methacylate plant, which will be built by Hawthorn Chemical Corp., at Louisiana, Mo. Hawthorn is the new company formed by Hercules Powder Co. and Imperial Chemical Industries, Ltd.

Mr. Cleary brings to his new post a broad background of experience in chemical manufacturing. For the past five years, he has been assistant plant manager of Hercules' Parlin, N. J., plant. He became assistant plant manager in 1951, after serving successively as power engineer, assistant mechanical superintendent and mechanical superintendent.

Other appointments for the new Hawthorn facility include two senior design engineers, formerly with ICI in England. They are **Geoffrey Ainsworth** and **Robert L. Stowell.** Mr. Cleary and the senior design engineers are working with Hercules' Engineering Department in connection with the layout, design, and construction of the new plant.

Mr. Ainsworth comes to Hawthorn after 10 years of experience with Imperial Chemical Industries, Ltd., in England. He joined ICI in 1946 following his release from service with the Royal Navy. He has since served in the General Chemicals Division of ICI, the division which manufactures methyl methacrylate monomer.

Mr. Stowell joined ICI in 1943. With ICI he worked in the Plastics Division, the division which converts methyl methacrylate monomers into polymers for use in sheets and molding powders.

MAAS & WALDSTEIN

Glenn R. Cunningham has been appointed a technical service representative for a section of the state of Ohio by Maas & Waldstein Co., manufacturers of lacquers, enamels, and synthetics. He will report to C. L. Berry, Manager of the company's Midwest Industrial Division, Chicago, Ill.

A native of Columbus, Ohio, Mr. Cunningham graduated in chemistry from Ohio State University in 1949. He has been active in the chemical and finishes fields since that time.

NEW JERSEY ZINC

Edward E. Schwegler has been elected a vice president of The New Jersey Zinc Co. He will continue to serve as Comptroller, however, a position he has held since 1951.

Mr. Schwegler started work at the company's Denver, Colo., office in 1916, becoming a traveling auditor in 1918. After spending several years in the Accounting Department of the Palmerton, Pa., plant, he was transferred to the New York office, and became Chief Auditor in 1937. He served as Assistant Comptroller from 1945 until his appointment as Comptroller.

PECORA PAINT

James Allen has been named as a Florida representative for Pecora Paint Company, Inc., of Philadelphia, Pa., and Dallas, Texas.

Having undergone intensive orientation at Pecora's Philadelphia manufacturing facility, Mr. Allen is said to be especially trained for the new position. He will maintain a headquarters in Orlando, Fla.

DU PONT

Frank H. Beadles, Assistant Director of Technical Sales in Du Pont's Finishes Division, has been named to succeed **Lyman H. Priday** as Director of Production. Mr. Priday retired on January 3 after a career of more than 34 years with the company.

Mr. Beadles joined Du Pont in 1929 as a chemist at the Philadelphia finishes laboratory. He was, subsequently, at the Chicago finishes plant laboratory from 1935 until 1945, at which time he was appointed Assistant Manager of the Flint, Mich., finishes plant.

In 1947, Mr. Beadles became Assistant Manager of the Parlin, N. J., finishes plant, and in 1950 returned to Chicago as Assistant Regional Sales Manager. He was named Manager of the plant's technical section, with headquarters in Wilmington, Del., in 1951, and has been Assistant Director of Sales since 1952.

Roy B. Davis, Assistant Director of the Research Division of the Fabrics and Finishes Department, will replace Mr. Beadles as Assistant Director of Technical Sales.

Mr. Davis joined the company in 1934 as a research chemist at the Philadelphia finishes laboratory. He was appointed Director of the Flint sales development laboratory in 1945, and returned to Philadelphia in 1950 as Assistant Director of the Marshall Laboratory. In 1953 Mr. Davis was promoted to Director of the Marshall facility. Since last May he has been Assistant Director of the Research Division of the Fabrics and Finishes Department.

Other personnel changes announced by Du Pont pertain to the field sales organization of Du Pont's Pigments Department.

A new district office for pigment sales has been established in Atlanta, Ga., with **J. H. McMillan** as Manager. Previously Mr. McMillan had been stationed in Atlanta, working out of the Philadelphia district office. **V. O. Webb** is assigned to the Atlanta office as salesman.

In the Chicago district, **Harry E. Schreiber,** Manager for the last 15 years, will retire March 31. He has been succeeded by **John L. C. Brooke,** formerly Boston district manager. Mr. Schreiber will remain as an adviser in the Chicago office until his retirement becomes effective.

JOHNS-MANVILLE

C. A. Cocks has been appointed New York District Sales Manager of Johns-Manville's Celite Division, according to an announcement by W. J. Bucklee, General Sales Manager of the Division.

Mr. Cocks will be responsible for sales in New England, New York, New Jersey, Maryland, Virginia, District of Columbia and part of Pennsylvania. He has been with Johns-Manville since 1939.

ST. JOSEPH LEAD

Herbert J. Due has been appointed Assistant Manager of Zinc Oxide Sales for St. Joseph Lead Co., New York, N. Y. He will operate out of the New York office.

Mr. Due joined St. Joe in 1926 and after 22 years in the accounting department served as Zinc Oxide Sales Representative in several eastern and southern states from 1948 to the present.

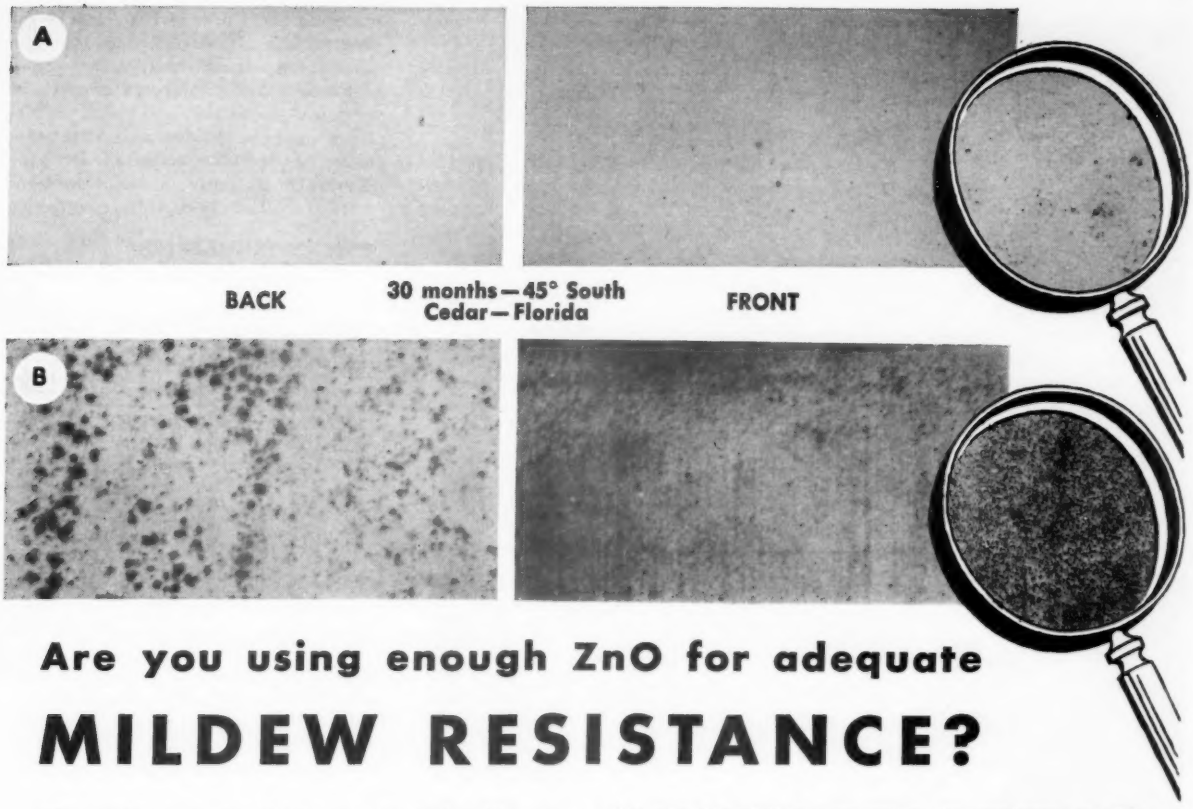
Mr. Due's new duties will include sales-promotion of the company's zinc oxide on a national basis, supplementing the work of its regular distributors.

ARMOUR

John M. Hoerner, formerly General Manager of the Armour and Company Chemical Division, has been appointed Assistant General Manager of the Armour Auxiliaries Group. He will be succeeded as head of the Chemical Division by **Edward A. Coons.**

Mr. Hoerner joined Armour in 1953 as Director of Purchases and Sales in the Chemical Division and became Division Manager in 1955.

Mr. Coons has had wide experience in chemical sales and production and in administrative positions.



Are you using enough ZnO for adequate

MILDEW RESISTANCE?

The cedar panels above are coated with conventional (linseed oil vehicle) exterior paints. The only difference: the zinc oxide content in the pigment of paint B has been reduced 44.5% ... from 2.7 to 1.5 pounds per gallon.

The result? Panel A is not seriously affected by mildew after 30 months exposure. Panel B shows extreme mildew deterioration – too little Zinc Oxide to meet specific local conditions.

The qualities which are imparted to any good paint by adequate quantities of zinc oxide are well known ... and time-proved. But, in balancing a formulation, zinc oxide levels may be cut too far for customer satisfaction. With this in mind, consider:

Are you formulating your paints for maximum possible quality?

Are you formulating your paints with enough zinc oxide?

ENOUGH ZINC OXIDE GIVES YOUR PAINT ...

- **Mildew resistance**
- Durability
- Opacity to ultra-violet light
- Tint retention
- Self-cleaning action

Technical reports are now being prepared by member laboratories of AZI on the benefits of proper zinc oxide usage. To receive copies of these reports, mail coupon.

AZI

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60 East 42nd Street, New York 17, N. Y.

Please send me future reports on paint formulation findings.

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COLUMBIAN CARBON

Wesley C. Ekholm has been promoted by Columbian Carbon Co. to the newly created post of General Manager of Manufacturing for the company's Carbon Black and pigment Division, with headquarters in New York. Previously, he had headed Columbian's Carbon Production as General Manager, with headquarters at Monroe, La.

W. C. Ekholm

Mr. Ekholm is an alumnus of Texas Christian University and Rice Institute, holding a Bachelor's degree in Chemical Engineering and a Master's degree in Chemistry. Throughout his business career he has been connected with Columbian Carbon Co. in various capacities.

M. R. Howell, who has held key positions in Columbian's carbon black production succeeds to Mr. Ekholm's previous post in Monroe.

Mr. Howell graduated from the University of Oklahoma with the degree of B.S. in Chemical Engineering with emphasis on Petroleum Technology. He makes his home in Monroe, La.

INTERCHEMICAL

William J. Rothemich has been elected a vice president of Interchemical Corp. Having joined Interchemical in 1933, he has previously been divisional president of both the R-B-H Dispersions Division and, most recently, the Textile Colors Division.

William N. Davies, a former vice president and eastern district manager of Interchemical's Printing Ink Division, succeeds Mr. Rothemich as head of the Textile Colors Division. He has been with Interchemical since 1927.

Francis A. E. Spitzer, former Interchemical secretary and head of its legal staff has been named vice president of its International Division. **Kenneth B. Lane,** a member of the legal staff since 1945, will succeed him.

EMERY INDUSTRIES

George R. Williams has been appointed sales representative in the New York City area for Emery Industries, Inc., Cincinnati, Ohio. Under the direction of J. W. Ritz, eastern district manager, he will handle Emery's line of organic Chemicals.

G. Williams

Mr. Williams holds B.S. degrees in Physical Science from the University of Chicago and in Chemical Engineering from the University of Wisconsin. Prior to joining Emery, he was the Cincinnati area salesman for Merck & Company, Inc.

GODFREY L. CABOT

Page Bullock, recently appointed technical sales representative of the White Pigments Department, has been assigned to a headquarters in Akron, Ohio. In his new location, he will assist company agents with Cabot sales of "Cab-O-Sil" and "Wollastonite" for the Akron, Detroit, Buffalo, Pittsburgh and Cleveland areas.

Mr. Bullock joined the Cabot firm in June, 1956. Previously he was associated with Merck & Co., Inc., Rahway, N. J., as a sales representative. He has also been associated with Du Pont de Nemours, Wilmington, Del.

COOK PAINT & VARNISH

Lathrop G. Backstrom, President of the Cook Paint & Varnish Co., Kansas City, Mo., has been elected Chairman of the Board. He will, however, also continue to serve as president.

At the same time, **W. H. Hoover,** Vice President in charge of Industrial Sales, has assumed duties as Executive Vice President.

M. D. Blackwell, Secretary, has been elected to the Board of Directors, filling a vacancy caused by the death of the late R. B. Caldwell.

DEWEY AND ALMY

Edward L. Mears has been appointed Manager of the Central Services Division for the Dewey and Almy Chemical Co., Division of W. R. Grace & Co. He will be in charge of industrial relations, public relations, advertising, purchasing and market research.

SHAWINIGAN

W. H. Bromley and **E. H. Finsilver** have been appointed to the newly created posts of General Sales Manager and Assistant General Sales Manager, respectively, for the Shawinigan Resins Corp. Both appointments are effective immediately.

Mr. Bromley, who has been Shawinigan's Director of Development since 1950, joined the company in 1943 as a research chemist. He holds academic degrees of B.S. in chemistry from Holy Cross College, M.S. in chemistry from Northeastern University and LL.B. from the University of Connecticut.

Mr. Finsilver, who has been Assistant District Sales Manager in the firm's New York office, transferred from Shawinigan Products Corp. when Shawinigan Resins organized its own sales staff in 1955. At Shawinigan Products he served in the research and development, technical service and sales departments and in 1952 was appointed the West Coast sales representative. He is a graduate in chemistry from Columbia University.

Elsewhere among Shawinigan Resins' personnel, there has been a realignment of various staff functions in the firm's marketing department. Effective immediately **W. K. Wilson,** Manager of Technical Service; **J. A. Cooper,** newly appointed Manager of Product Development; and **D. H. Fraser,** Manager of Market Research, will assume responsibilities of departmental status. All will be responsible to A. W. Dunning, Director of Marketing.

Assistant district sales managers who have been acting managers during the establishment and early development of their territories will assume the full title and responsibilities of district managers. The district managers, **C. A. Godsell,** New England; **F. H. Hoyt,** New York; **W. M. Young,** Chicago; **L. Roland,** West Coast; and **W. F. Hill,** Atlanta, will report to W. H. Bromley, newly appointed General Sales Manager.

NUODEX PRODUCTS

Robert C. Brumberger has been appointed Manager of Chemical Industry Sales for Nuodex Products Co., Division of Heyden Newport Chemical Corp. In the new position, he will direct Nuodex sales activities in the petroleum, grease and other industry fields.

From 1950 to 1955 Mr. Brumberger was associated with Nuodex as Manager of Industrial Fungicides and as Chemical Industry Manager. Subsequently, he was a special representative for Rexton Finishes, Inc., until his present assignment.

Another NEW 'HORSE HEAD' PIGMENT

XX-602 ZINC OXIDE

(LEAD FREE)

HIGHEST CONSISTENCY–ACICULAR

SAVES MONEY–IMPROVES QUALITY

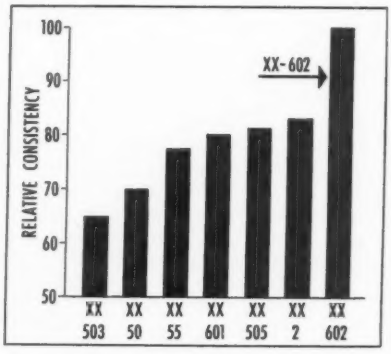
Now a major new development in Horse Head zinc oxides—XX-602*—enables you to save money and improve the quality of your outside house paints.

SAVE MONEY

XX-602 imparts highest consistency—even higher than any other Horse Head zinc oxide (see chart). Thus you can obtain desired body with minimum pigmentation.

IMPROVE QUALITY

XX-602 provides excellent appearance, outstanding tint retention, low rate of chalking, high resistance to erosion, and good durability—because its particles are highly acicular (see electron micrograph) and free of colloidal fines.



But whether you need an oxide of high consistency, or low, or in between, you will find it in the Horse Head line — the most complete assortment of quality zinc oxides.

Our sales representative in your area will be glad to discuss the application of our various zinc oxides in your specific products.

*Meets military specification MIL-Z-15486A and federal specification TT-Z-301A.

THE NEW JERSEY ZINC COMPANY

Founded 1848

160 Front Street, New York 38, N. Y.

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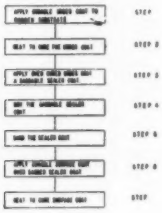
HORSE HEAD PRODUCTS

PATENTS

Complete copies of any patents or trade-mark registration reported below may be obtained by sending 50c for each copy desired (to foreign countries $1.00 per copy) to the publisher.

Method of Finishing Wood

U. S. Patent 2,772,986. Allen C. Buck, Drexel Hill, Pa., assignor to E. I. du Pont de Nemours and Company, Wilmington, Del., a corporation of Delaware.



U. S. Patent No. 2,772,986

An improved method of finishing wood comprising the steps of applying to a wooden substrate a polymerizable undercoat composition comprising cellulose nitrate and at least 45% of a monomeric acrylic diester selected from the group consisting of acrylic acid diesters and methacrylic acid diesters of a lower aliphatic dihydric alcohol in a volatile organic solvent, curing said undercoat to an insoluble stage by heating, superimposing over said cured undercoat a sandable cellulose nitrate containing sealer coating composition in a volatile organic solvent, drying said sealer coat, sanding said dried sealer coat to a desired degree of smoothness and applying over the said sanded sealer at least one coat of polymerizable surface coating composition comprising cellulose nitrate and at least 45% of a monomeric acrylic diester selected from the group consisting of acrylic acid diesters and methacrylic acid diesters of a lower aliphatic dihydric alcohol in an organic volatile solvent, and heating said polymerizable surface coating to cure said acrylic diester, said percentages being based on the total weight of non-volatile film forming components in the respective compositions.

Polymerizing Vinyl Chloride

U. S. Patent 2,772,256. Michael A. Manganelli, Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo., a corporation of Delaware.

A process for preparing a porous granular polymer which comprises polymerizing 100 parts of vinyl chloride in suspension in from about 100 to 200 parts of water containing from about 0.01 to 1 part of a water-insoluble, oil soluble polymerization catalyst and a suspending medium consisting of from about 0.1 to 1 part of a heteropolymer of vinyl acetate and a compound taken from the group consisting of maleic acid and maleic anhydride and from about 0.1 to about 0.3 part of an ethylene oxide condensate of a saturated fatty acid mono-ester of a compound taken from the group consisting of ethylene glycol and glycerol, the fatty acid residue of said mono-ester containing from 12 to 24 carbon atoms, said condensate having a mclar ratio of ethylene oxide tc fatty acid mono-ester of from about 5:1 to about 15:1.

Phthalocyanine Pigments

U. S. Patent 2,770,629. John W. Eastes, Somerville, N. J., assignor to American Cyanamid Company, New York, N. Y., a corporation of Maine.

The method of producing a finely-

divided, tinctorially strong, non-crystallizing, red shade, beta form metal phthalocyanine pigment which comprises slurrying a phthalocyanine crude pigment prepared in an autoclave in a saturated alicyclic hydrocarbon solvent, in an aqueous medium comprising sulfuric acid, the sulfuric acid concentration being between about 62.5% and about 80%, drowning the pigment-acid slurry in water, separating the pigment, and neutralizing acid remaining in the pigment.

Decorative Coating

U. S. Patent 2,773,855. Jerome Hochberg, Newburgh, and Silvio A. Pellerano, Brooklyn, N. Y., assignors to Allied Chemical & Dye Corp., New York, N. Y., a corporation of New York.

A liquid composition containing an active component adapted to be dispersed in aerosol form and a propellant agent; said active component constituting from about 5% to about 25% by weight of said composition and comprising a normal butyl-isobutyl methacrylate copolymer in amount at least 2% by weight of said composition, and a paratertiary butyl phenol-formaldehyde oil soluble thermosetting resin about 50% soluble at about room temperature in a liquid mixture containing by weight 76% CH_3CClF_2—16% CCl_2F_2—8% CCl_3F, said resin being present in amount at least 3% by weight of said composition; said active component being incorporated in said propellant agent, which is a normally gaseous chlorofluorocarbon containing not more than two carbon atoms, held under sufficient pressure to maintain the same in the liquid phase.

Organic Pigment Production

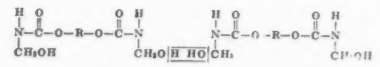
U. S. Patent 2,772,983. Godfrey Grimm, Short Hills, and Alfred A. Brizzolara, Belleville, N. J., assignors to E. I. du Pont de Nemours & Co., Wilmington, Del., a corporation of Delaware.

A method of stabilizing Benzidine Yellow against loss of strength on aging while retaining the ability to confer on inks and coating compositions made therefrom substantially the same opacity and the same rheological properties as freshly prepared untreated Benzidine Yellow which comprises precipitating on the freshly prepared pigment in aqueous suspension from about 10-30% based on the weight of said pigment of a metallic rosinate of a second group metal between atomic numbers 12 and 56 in the presence of a dialkyl ester of an alkali metal sulfo succinate containing from 1-8 carbon atoms in each alkyl radical.

Lacquers From Dimethylol Derivative of a Diurethane

U. S. Patent 2,773,853. Adolf Weihe, Kronberg, Taunus, Germany, assignor to Herbig-Haarhaus Aktiengesellschaft Lackfabrik Koln-Bickendorf, Koln-Bickendorf, Germany a firm.

Process for producing a resin to be utilized as a stoving lacquer, comprising preparing an aqueous solution of a dimethylol derivative of a diurethane, mixing said solution with at least a single organic solvent as an azeotropic agent, adjusting the mixture to an acidic pH value, subjecting the mixture to azeotropic distillation to dehydrate the mixture and form methylene ether bridges according to the following formula



U. S. Patent No. 2,773,853

wherein R is a bivalent group, and allowing the resin formed to dissolve in said solvent.

Pigment

U. S. Patent 2,772,984. Bertram M. Helfaer, Hamburg, N. Y., assignor to Allied Chemical & Dye Corp., New York, N. Y., a corporation of New York.

Pigments of improved dispersibility and tinctorial value comprising a water-insoluble organic color in finely divided form admixed with an activated silica gel having a surface area of at least 100 square meters per gram, an oil absorption value of at least 100, and an average particle size of from 0.01 to 50 microns, said silica gel being present in amount of from 1/20 to 20 parts by weight per part by weight of organic color.

Pigmented Waxes

U. S. Patent 2,772,982. Vincent C. Vesce, Smoke Rise, Kinnelon, N. J., assignor to The B. F. Goodrich Co., New York, N. Y., a corporation of New York.

A solid organic wax color master batch consisting essentially of pigmented solid organic wax in the form of free-flowing particles possessing a chromaticity not substantially less than the pigment portion thereof.

Fortified Emulsion Paints Containing A Zirconyl Compound

U. S. Patent 2,773,850. Victor M. Willis, Chicago, Ill., assignor to The Sherwin-Williams Co., Cleveland, Ohio, a corporation of Ohio.

In an oil-in-water emulsion coating composition characterized by a dispersed oil phase capable of depositing stet films, a continuous water phase and a minor proportion of at least one surface active agent of the anionic class and a pH greater than 7, the improvement which includes the addition of a quantity of a water soluble ionizable, non-pigmentary, non-refractory inorganic ammonium salt of zirconium equivalent to not more than about ten pounds of ZrO_2 per 100 gallons of the emulsion paint product.

Wood Stain Method of Increased Lightfastness

U. S. Patent 2,772,137. Ira Weber, Long Island City, N. Y., assignor to Interchemical Corporation, New York, N. Y., a corporation of Ohio.

In the method of staining wood consisting of applying to the wood a solution of the alkali salt of at least one sulfonic acid-azo dyestuff in a penetrant vehicle consisting of a mixture of ethyl ether of ethylene glycol and methanol, the improvement which consists in applying to the stained surface a solution consisting of 5 to 10% by weight, of a heavy metal salt of the group consisting of the salts of barium, calcium, strontium, manganese and aluminum, dissolved in a solvent consisting of a mixture of ethyl ether of ethylene glycol and methanol.

(*From page 48*)

$[\eta]$ seems to increase with solvent power in each homologous series of solvents for cellulose nitrate and ethyl cellulose and to tend to a limit as χ decreases. Although the chains are stiffer than those of flexible polymers some variation in configuration seems possible. The small variation of $[\eta]$ with solvent shows that this is not large but the limiting value may reflect complete extension, slightly less extended configurations being adopted in poorer solvents. The values of $[\eta]$ are greater, with cellulose nitrate, for alkyl acetates than for ketones of comparable solvent power and larger values of $[\eta]$ are obtained with ethyl cellulose in the poor non-polar solvents. Solvent type is clearly important.

This is particularly so in the case of cellulose acetate. There is no obvious relationship between $[\eta]$ and χ. Acidic solvents and aniline tend to give higher values of $[\eta]$ than the basic pyridine and picolines with more neutral solvents, such as acetone and methyl acetate, giving intermediate values.[5] Intramolecular hydrogen bonding between primary hydroxyl and acetyl groups on neighbouring glucose residues is possible and may stiffen the chains. Acidic solvents and aniline, bound to acetyl groups by hydrogen bonds, do not break the intramolecular bonds. Basic solvents, attached to hydroxyl groups, may do so and permit less extended chains and lower values of $[\eta]$. This suggestion helps to explain the decrease in $[\eta]$ with increasing degree of substitution of cellulose acetate.[25] Acetylation will remove hydroxyl groups and hence the intramolecular bonds so that less extended configurations will be possible.

There is no apparent relationship between k' and χ, with any of the three derivatives, no doubt because of the extended nature of the chains. The initial slopes of the viscosity number against concentration plots vary considerably but $[\eta]$ varies only relatively little in each homologous series of solvents for cellulose nitrate and ethyl cellulose. Since the initial slope can be written as $k'[\eta]^2$ it is unlikely that k' will vary with solvent power in the manner observed with flexible polymers. The initial slopes tend to increase with solvent power in each homologous series of solvents for both cellulose nitrate and ethyl cellulose. High slopes are, however, associated with the poor non-polar solvents for ethyl cellulose showing that factors other than solvent power affect the slope. Association of polymer, leading to structural viscosity effects or to extensive hydrodynamic interaction between aggregates, would be expected to increase the slope.

There would seem to be no clear relationship between the Spurlin parameter k_s and solvent power. Spurlin, Martin and Tennent,[26] using benzene, acetone and methyl acetate as solvents for ethyl cellulose found k_s decreased with increasing solvent power. Table 6 shows this to be so as far as these three solvents are concerned but not if the whole range is considered. Association in poor solvents may lead to high values of the slope of a logarithmic plot of viscosity number against c and to large values of k_s. In good solvents of the same type the variations of slope and $[\eta]$ seem to give roughly constant values of k_s.

Conclusion

It must be emphasized that the work described refers to dilute solutions. In technical applications more concentrated solutions are used. The precipitation results compare well with those obtained with such solutions but rather different viscosity behaviour may be expected. It is possible that poor solvents, because of structural and aggregation effects, may give higher viscosities than good. Extrapolation of results obtained with dilute solutions to more concentrated ones is a problem requiring solution. Other problems include the precise nature of the solvation process and the restriction of relationships, in many cases, to homologous series. The general features of cellulose derivative-solvent interaction seem, however, to be fairly clear. If solvation and the stiffness of the chains is taken into account it seems possible to interpret many properties of dilute solutions, at least qualitatively, in terms of current theories of high polymer-solvent interaction.

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NEWS

Milton Goll Addresses ACS Paint Section Group

The February meeting of the Paint, Plastics and Printing Ink Group of the Philadelphia Section, American Chemical Society, was addressed by Milton Goll, well-known authority on industrial microbiology. Mr. Goll, who is Technical Director of the Fungicides Division, Troy Chemical Corp., discussed "Fundamental Aspects of the Microbiology of Organisms Attacking Paints and Plastics."

The presence of mildew on paint films affects their appearance and contributes to their failure, Mr. Goll pointed out. He said one species of fungus, *Pullularia sp.*, has been consistently isolated, and has been found to be the cause of mildew on films of oil, alkyd and oleoresinous paints. Other fungi have been observed to be of secondary importance.

February's paint meeting was held on February 7 in the Physical Sciences Building of the University of Pennsylvania. It was preceded by an informal dinner at the Lido Restaurant.

Benjamin Moore Explains Study of Paint Trends

Benjamin Moore & Co. has recently released information from its Color Research Department to show how it picks its paint colors. It is the Company's contention that color trends develop not from fancy, but from foreseeable facts. They say it is the function of the Color Research Department to get these facts and keep a company informed of the directional trends.

According to the Company, the first job for a Color Research Department is to check its firm's own sales records. By charting the gallonage record of each color in a given product, Benjamin Moore says it can be determined whether a color is gaining or losing in popularity. To verify findings, the Department then exchanges its color information with top manufacturers of related merchandise such as wall coverings, fabrics, linoleum and exterior products such as roofing and siding.

Members of the Color Research Department are also advised to make "shopping trips" to leading department stores and fabric houses where they can examine and analyze color in home furnishings currently being sold. In this way, they have a further check on whether the manufacturers' color lines are on the right track.

But past records and current sales are only part of the story. Also important in the Benjamin Moore method are field trips covering home furnishing displays in stores, display rooms and home shows, coupled with a careful analysis of the leading shelter magazines. These are the trial balloons, the introduction of new ideas, that will be eventually accepted or rejected by the American populace.

On the basis of its own findings, Benjamin Moore & Co.'s Color Research Department makes the following color predictions: Beige, pink and light, clear blues will be among the best selling paint colors in 1957. The trend will be towards the increased use of neutrals such as off white and beige and towards clean, clear colors that are very light in value. Cool grays and straight greens will probably show a decline.

NEWS

Survey Shows Wide Use Of X-Ray For Analysis

X-ray diffraction techniques are employed for difficult analysis tasks in 38 different fields, according to answers received so far in a nationwide survey being conducted by the Educational Department, North American Philips Company, Inc., Mount Vernon, N. Y.

Over 40 per cent of the plants and laboratories surveyed reported use of X-ray diffraction and spectrography for mineral analyses; 30 per cent for metals and alloys; 41 per cent for chemicals, including organics and inorganics; 12 per cent for corrosion products; 10 per cent for soils; and nine per cent for dusts and air pollution.

Also, eight per cent of the users were found to work on ceramic and glass problems; nine per cent on plastics, fibers and elastomers; five per cent on pigments and polymers; 13 per cent on abrasives, refractories, slags, intermetallics and furnace products; four per cent on drugs and narcotics; four per cent on water treatment and deposits; six per cent on soaps, greases, oils and waxes; six per cent on catalysts; and three per cent on general crystal work.

Initiated as an educational project, the survey is expected to provide a source of up-to-date information for those who contemplate working with or who are currently working with the various X-ray techniques.

•

W. H. Mylander Keynotes Southwestern Convention

William H. Mylander will be the keynote speaker at the business meeting for the Southwestern Paint Convention, to be held April 27 in Houston, Texas. The meeting will follow a Raw Materials Exhibit and a reception and buffet, scheduled to take place on Friday, April 26, opening day for the Convention.

Mr. Mylander, Administrative Assistant in the Du Pont Public Relations Department, has a long background as a journalist and publicist. In his newspaper experience, he spent many years as a Washington correspondent. At other times he was attached to the Press Division of the Office of Censorship (during World War II), and was Assistant to the chairman of the Republican National Committee in charge of public relations (from 1950 to 1952).

•

1956 Construction Awards Set Dollar Volume Record

The year 1956 set a new record in dollar volume of contract awards for future construction in the 37 states east of the Rockies, F. W. Dodge Corp., construction news and marketing specialists reported. At $24,412,630,000, the awards were three per cent greater than the 1955 total.

The cumulative awards for the year 1956 also established all-time records in dollar volume in two major construction categories: nonresidential awards at $9,005,948,000, were six per cent greater than the similar 1955 period; heavy engineering at $5,580,222,000 showed a 10 per cent increase. However, residential awards at $9,826,460,000 were down four per cent compared to 1955 although they were the second highest ever recorded.

NEWS

New ADM Film and Booklet Describe Sales Techniques

"Positive Selling", the sales plan that has proved successful for many painting contractors, has been put on film by Archer-Daniels-Midland Co. It can be obtained from the Painting-Contractors Service Bureau, Archer-Daniels-Midland Co., 700 Investors Bldg., Minneapolis 2, Minn.

Designed especially for showing to paint contractors, paint distributors, trade associations and paint industry sales meetings, the new film features the plan's most effective ideas and sales aids. The 15-minute, full-color, 35 mm strip film sets forth the principles and techniques of positive selling in a recorded commentary by Bill Gove, one of the nation's foremost authorities on salesmanship.

ADM also has published a booklet, "How Painting Contractors Are Increasing Their Sales with Positive Selling," which presents in summary form the returns in new business obtained by more than 100 contractors using the "Positive Selling" plan. The new film and booklet provide materials for a complete program on better selling methods.

•

J. H. Day Becomes Division Of Cleveland Machine Co.

Harold R. LeBlond, President of The Cleveland Automatic Machine Co., Cincinnati, Ohio, has announced his company's merger with The J. H. Day Company, Inc., also of Cincinnati.

The merger became effective on December 31, 1956, and the name of the continuing corporation is The Cleveland Automatic Machine Co. Day operations will be continued as the J. H. Day Company Division of the Cleveland Automatic Machine Co.

The J. H. Day Company was founded in 1887 and is one of the leading companies which builds processing machinery. This equipment is widely used in the paint and varnish, printing ink, chemical, and pharmaceutical industries.

CALENDAR OF EVENTS

Feb. 20-22. Spring meeting, Committee D-1, ASTM, Shoreham Hotel, Washington, D.C.

Feb. 21-22. 11th Divisional Protective Coating Conference, Chemical Institute of Canada. Feb. 21—Seaway Hotel, Toronto; Feb. 22—Ritz Carlton Hotel, Montreal.

April 10-13. Twenty-first annual convention of the Southern Paint and Varnish Production Club, Soreno Hotel, St. Petersburg, Fla.

April 26-27. Southwest Paint Convention and Raw Material Exhibit, Shamrock Hotel, Houston.

Production Club Meetings

Baltimore, 2nd Friday, Park Plaza Hotel.

Chicago, 1st Monday, Furniture Mart.

C.D.I.C., 2nd Monday.
Cincinnati — Oct., Dec., Mar., May, Hotel Alms.
Dayton — Nov., Feb., April, Suttmilers.
Indianapolis — Sept., Claypoll Hotel.
Columbus — Jan., June, Fort Haynes Hotel.

Cleveland, 3rd Friday, Harvey Restaurant.

Dallas, 1st Thursday after 2nd Monday, Melrose Hotel.

Detroit, 4th Tuesday, Rachham Building.

Golden Gate, 3rd Monday, E. Jardin Restaurant, San Francisco.

Houston, 2nd Tuesday, Bill Williams Restaurant.

Kansas City, 2nd Thursday, Pickwick Hotel.

Los Angeles, 2nd Wednesday, Scully's Cafe.

Louisville, 3rd Wednesday, Seelbach Hotel.

New England, 3rd Thursday, University Club, Boston.

New York, 1st Thursday, Brass Rail, 100 Park Ave.

Northwestern, 1st Friday, St. Paul Town and Country Club.

Pacific Northwest, Annual Meetings Only.

Philadelphia, 3rd Wednesday, Philadelphia Rifle Club.

Pittsburgh, 1st Monday, Gateway Plaza, Bldg. 2.

Rocky Mountain, 2nd Wesnesday.

St. Louis, 3rd Tuesday, Kings-Way Hotel.

Southern, Annual Meetings Only.

Toronto, 3rd Monday, Oak Room, Union Station.

Western New York, 1st Monday 40-8 Club, Buffalo.

ISOBUTYL ALCOHOL

(*From page 39*)

Thinners

Because isobutyl alcohol and isobutyl acetate are low in cost, they may be used advantageously in either high, medium or low quality lacquer thinners. Typical examples of such thinners are shown in Table 11.

	High Quality	Medium Quality	Low Quality
Ethyl acetate	10	10	10
Isobutyl acetate	22	17	12
Ethyl alcohol	7	6	10
Isobutyl alcohol	11	9	6
Toluene	50	58	62
	100	100	100

Table 11. Composition of three types of thinners.

MATERIAL INDEX

Material	Type	Source
Amberol 801	Maleic ester gum	Rohm and Haas Company
Amberol 820	Maleic ester gum	Rohm and Haas Company
Arochem 650	——	Archer, Daniels, Midland Company
D. C. 200 (1,000 cs.)	Silicone	Dow Corning Corporation
Dow 276-V9	Polymethylstyrene	Dow Chemical Company
Duraplex ND-77B	Coconut oil alkyd	Rohm and Haas Company
FCD 555B	Dehydrated castor oil alkyd	France, Campbell and Darling Company
Half-Second Butyrate	Cellulose ester	Eastman Chemical Products, Inc.
Nitrocellulose	Cellulose ester	Hercules Powder Company
Paraplex G-50	Polyester	Rohm and Haas Company
Santolite MHP	Aryl sulfonamide-formaldehyde	Monsanto Chemical Company

Calvert-Mount Winans Co. Chooses Two Sales Agents

Calvert-Mount Winans Company, Inc., Baltimore, Md., has announced the dual appointments of The O. Hommel Company as its exclusive sales representative in the Pittsburgh area and of Dowdy Brothers as its sole representative in the Philadelphia district.

Under the direction of Jim McCrory, The O. Hommel Company will promote CMW's entire line of polyesters, alkyds, and polyvinyl acetate emulsions.

Harry and John Dowdy, of Dowdy Brothers, will also now promote the full line of CMW products. They have been servicing the protective coating and allied industries for over 20 years.

•

Mantrose Moves Headquarters

M. A. Rosen, President of the Mantrose Corp., a large manufacturer and bleacher of shellac, has announced the move of his company's general offices to One Hanson Place, Brooklyn, N. Y., and the transfer of its manufacturing operations to the plant of its wholly-owned subsidiary, Attleboro Manufacturing Corp., Attleboro, Mass.

•

Kentucky Changes Address

The Kentucky Color & Chemical Co. has changed the address of its Eastern sales office to 17 Academy St., Newark 2, N. J.

Kentucky's office had been located for the last 35 years in Brooklyn, N. Y.

•

Cadar Acquires New Line

Cadar Paint Corp., Baltimore, Md., states that it is now manufacturing and distributing Macco brand paints, which were formerly manufactured and distributed by James B. Macneal Company, Inc. of Baltimore.

Burgess C. Macneal has joined the Cadar Paint Corp., assuming a position in the Sales Department.

TECHNICAL Bulletins

MOLYBDATES

"Properties of Heteropolymolybdates," a 15-page bulletin covering properties, uses, classification, nomenclature and preparation of these compounds, has just been released by Climax Molybdenum Co., Dept. PVP, 500 Fifth Ave., New York 36, N. Y.

In special sections of the bulletin a bibliography of reference material is included and caution is given against indiscriminate use of other available literature, much of which is claimed to be inaccurate.

MILLING EQUIPMENT

Publication of a new 24-page manual, "Grinding and Mixing Equipment," Bulletin 280, has been effected by the U. S. Stoneware Co. It may be obtained by writing to Process Equipment Division, Dept. PVP, The U. S. Stoneware Co., Akron 9, Ohio.

In addition to detailed information on the complete U. S. Stoneware lines of grinding and mixing equipment, Bulletin 280 incorporates a special chapter dealing with Principles of Jar, Ball and Pebble Milling. This section describes the various types of mills, linings and grinding media available, and discusses applications for each type.

HEVEA LATEX

"Unitex", a centrifuged natural hevea latex from British Malaya, is the subject of a new 20-page illustrated booklet from Stein, Hall & Co., Inc.

The new booklet contains a complete description of "Unitex", from the planting of rubber trees to delivery of the latex to consumers. It also gives detailed information on the services offered by Stein Hall in connection with the product.

Copies of the booklet are available from Latex & Rubber Dept., Stein, Hall & Co., Inc., Dept. PVP, 285 Madison Ave., New York 17, N. Y.

TEMPERATURE CONTROL

The Burling Instrument Co., Dept. PVP, 16 River Rd., Chatham, N. J., has issued a two-page, illustrated, descriptive bulletin covering their Model L-1S temperature control unit.

Included in Bulletin 106 are a description of the unit's differential expansion operation, specifications giving temperature ranges, tube sizes, and accuracy.

STRAPPING MACHINE

Steel strapping and packaging operations of the Acme Steel F3 Strapping Machine are described in a new folder published by Acme Steel Co., Dept. PVP, 135th and Perry Ave., Chicago 27, Ill.

Typical applications of the F3 machine, as well as its specifications, are shown and described in the new folder. The folder is four pages, illustrated and in color.

INSTRUMENT LINE

The General Scientific Equipment Co., Dept. PVP, 7516 Limekiln Pike, Philadelphia 50, Pa., has issued a new bulletin illustrating and describing a line of combustion-testing and air measurement instruments.

Bulletin No. 138 lists Gas Pressure Manometers, Oil Flow Graduates, Sling Psychrometers, Air Velocity Meters, Filter Gauges, Recording Thermometers, and other combustion-testing and air measurment instruments.

ECONOMICAL PACKAGING

Some answers to packaging problems are contained in a new packaging booklet, "How To Save Labor Costs with Corrugated Boxes," by Hinde & Dauch, Dept. PVP, Sandusky, Ohio.

The publication is the latest in a series of 12 booklets in the "Little Packaging Library." It offers new labor-saving ideas on the use of corrugated boxes, provides a yardstick for measuring packing costs, and discusses minimization of packing costs through simplification of package design.

The booklet also tells what improved package design can do to eliminate unnecessary packing pieces, lower shipping weight, and reduce worker fatigue, and deals with other subjects of timely interest.

TEMPERATURE CONTROL

A three-part report of research on devices for laboratory temperature control is being released to industry through the Office of Technical Services, U. S. Department of Commerce.

Part One of the report is devoted to the principles of temperature control in the laboratory. Important factors in the design of water baths are discussed, most-used types of temperature sensing elements are identified, and circuits for electronic relay controls for use with mercury regulators and thermistors are described.

Part Two deals with two types of electronic relays which can be built in the laboratory, and Part Three describes a thermistor operated controller which allows temperature to be set by a dial and controlled to plus or minus 0.01°C. or better.

The 55-page report may be ordered for $1.50 from OTS, U. S. Department of Commerce, Washington 25, D. C.

SYNTHETIC PARAFFIN

An attractive four-page brochure on "Paraflint", a new synthetic paraffin imported from South Africa, has been prepared by Moore & Munger, Dept. PVP, 33 Rector St., New York 6, N. Y.

The literature describes the chemical and physical characteristics of "Paraflint" and gives suggested uses for it as a modifier of other substances.

A-C POLYETHYLENE

A revised 24-page brochure on emulsifiable A-C Polyethylene is available from Semet-Solvay Petrochemical Division, Allied Chemical and Dye Corp., Dept. PVP, 40 Rector Street, New York 6, N. Y.

The new edition contains data on many types of emulsions and emulsifiers. Typical formulations for floor polishes and automobile cleaner-polishes are also listed.

The publication discusses typical properties of A-C Polyethylene 629, laboratory methods for preparation of basic emulsions, emulsifiers for A-C Polyethylene 629, typical emulsion polishes, and miscellaneous polishes.

MOTOR SELECTION

The new 12-page "Reliance Motor Selector", published by Reliance Electric and Engineering Co., gives information on how to select a-c motors for specific applications. Amplification is made by use of numerous tables, graphs and diagrams.

Included in the new booklet, Bulletin B-2103-1, are such comprehensive selection data as speed-frequency relationship, National Electrical Manufacturers Association current and torque values, and dimension charts and mechanical modifications for differing frame sizes.

Two pages of the booklet are devoted to a pictorial glossary of motor enclosure terminology. Reliance Electric and Engineering Co., Dept. PVP, 1088 Ivanhoe Rd., Cleveland 10, Ohio.

TRUCK COUPLERS

Couplers for use on power industrial trucks are described and illustrated in a new Truck Engineering Bulletin released by The Elwell-Parker Electric Company, Dept. PVP, 4205 St. Clair Ave., Cleveland 3, Ohio.

The bulletin covers the pin type and the double height pin type couplers, the automatic coupler which can be adapted for hand or foot operation, and the remote control pin type which permits hand or foot operation from the driver's seat.

"U" bolt type couplers and the pin type with chain are also described and illustrated.

GLASS LAB EQUIPMENT

A new catalog of products for the wet laboratory by Glass Engineering Laboratories, Dept. PVP, 571 O'Neill Ave., Belmont, Calif., includes illustrations, data tabulations and price information on all Glenlab products.

Included are Fractionating-Distillation Columns in diameters from 5/8 to 4 inches; Packing-Type Columns in diameters from 3/4 to 2 inches; Concentric-Tube Columns, and Still Heads in both automatic liquid-dividing and automatic vapor-dividing types.

Also included are Solenoids, Timers and Feed Sections, and other auxiliaries. The company's available services in the manufacture of specialized glass apparatus is described in another section of the publication.

LATEX POLYMERS

The Chemical Division of the Goodyear Tire & Rubber Co., Inc., Dept. PVP, Akron 16, Ohio, has published a compilation of seminars conducted on synthetic latex polymers at Camas, Wash., and Atlanta, Ga., over the past year.

The 44-page booklet contains articles on the development, production, evaluation, properties, and uses of synthetic latices.

The articles were written from presentations of key Goodyear personnel during the course of the seminar program.

DRUM RECONDITIONING

Eleven machines for repairing and reconditioning used steel drums are described and illustrated in Bulletin B of the L. M. Gilbert Company, Dept. PVP, 1505 Race Street, Philadelphia 2, Pa.

WET GROUND MICA

Technical Bulletin No. 28A of the Wet Ground Mica Association, Inc., Dept. PVP, 420 Lexington Avenue, New York 17, N. Y., provides supplemental information to Technical Bulletin 28 on the influence of wet ground mica on the adhesion characteristics of latex paint.

Bulletin 28A treats the differences observed between coatings of latex paints on steel panels coated with O. D. Enamel of Specification TT-E-485 B and those having a coat of Sea Blue Test Lacquer of Specification MIL-L-7178.

Bulletin 29 studies the sedimentation characteristics during storage of pigmented organic coating materials.

The bulletin describes three tests on the settling of a given pigmentation in a paint system.

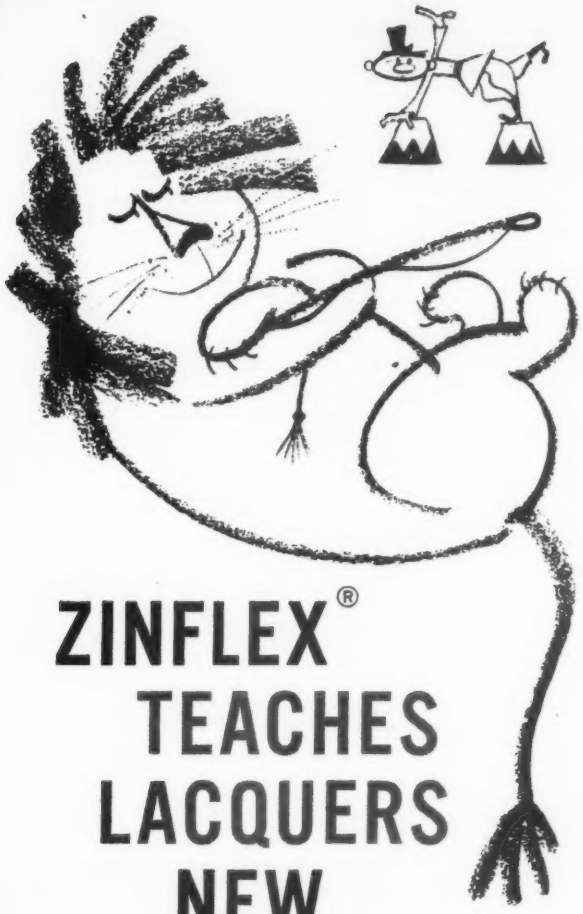
The first test entails the use of metal organic anti-settling additives. The second deals with the use of organic dispersing agents which might react with the surface of the pigment particles in such a manner as to counteract their tendency to stick together.

The final test involves the use of a precoating or pretreatment of the pigment particles, before their use in paints, by some form of surface coating material which might increase the dispersibility of the pigment in the paint.

FLASH-POINT TESTERS

Flash-point testers are the subject of a new bulletin from Fisher Scientific Co., Dept. PVP, 717 Forbes St., Pittsburgh 19, Pa. The Bulletin, FS-260, describes the operation of and uses for various closed and open testers manufactured by Fisher.

Included in the bulletin are the "Fisher/Tag" Pensky-Martens, Tag, and Foster closed testers; and "Fisher/Tag" Tag and Cleveland open testers. Accessories are also listed and priced.



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